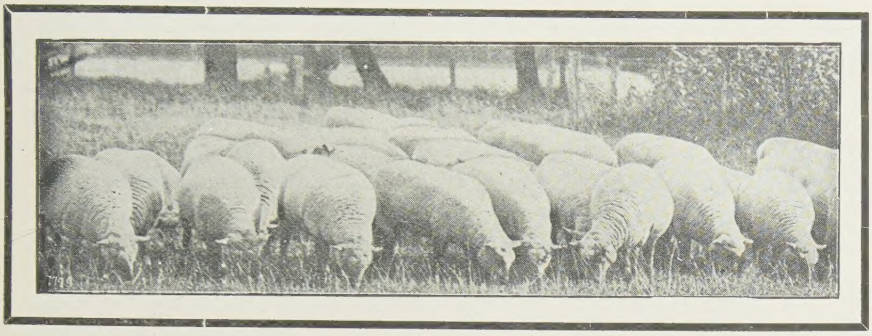

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WHITE-CLOVER SEED:

ITS ADULTERATION.

A. H. COCKAYNE.

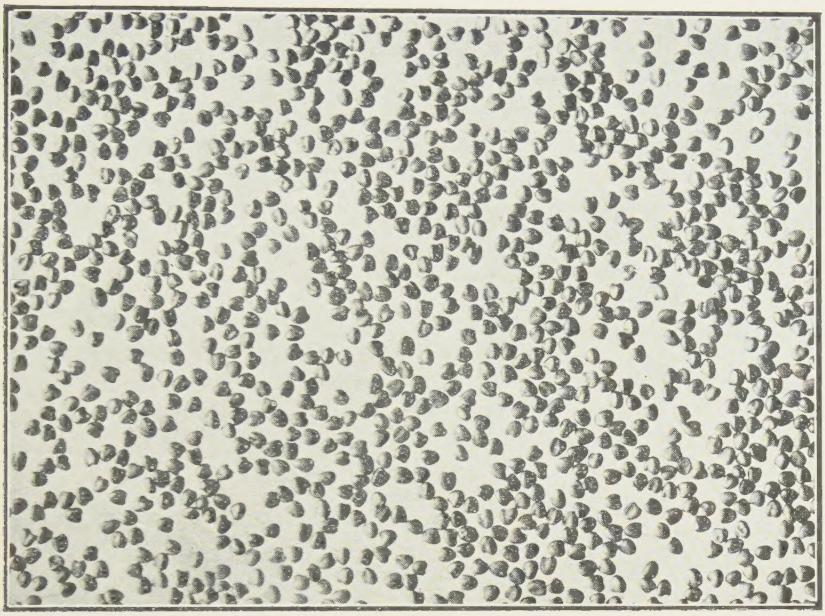
THE use of impure seed is the most serious economic mistake in agricultural operations, and much of this waste is caused by failure of the farmer to study the question as a simple business proposition. The true value of an article is generally indicated by the price at which it is offered for sale. If a low price is asked it should be obvious that, generally speaking, there is some reason for this which is not disclosed to the purchaser. The farmer who looks for cheap seed—and his class is, unfortunately, large—should at least know just what he is buying, when, if he has any business capacity, he will probably realize that what is cheap at first sight is bound to prove actually very dear in the end. The seed of white clover, generally the most impure of all

seeds, is a case in point. It is not uncommon in lines of fair quality to find from 15 to 20 per cent. of extraneous seeds, consisting mainly of those of various pasture weeds. Such seed is manifestly very badly cleaned, but the impurities are merely those harvested with the crop and have not been added to the line. It is the blending and adulteration of white-clover seed, so frequently practised, which constitutes the great weakness in clover-seed operations. The highest grade of white-clover seed has a purity of 99 per cent., and such seed is the type the farmer should always employ in his sowing operations. It is the cheapest because it is the best. It may be the highest-priced seed if judged by the pound weight, but, gauged by the number of living white-clover seeds the pound contains, it is invariably the cheapest article on the market.

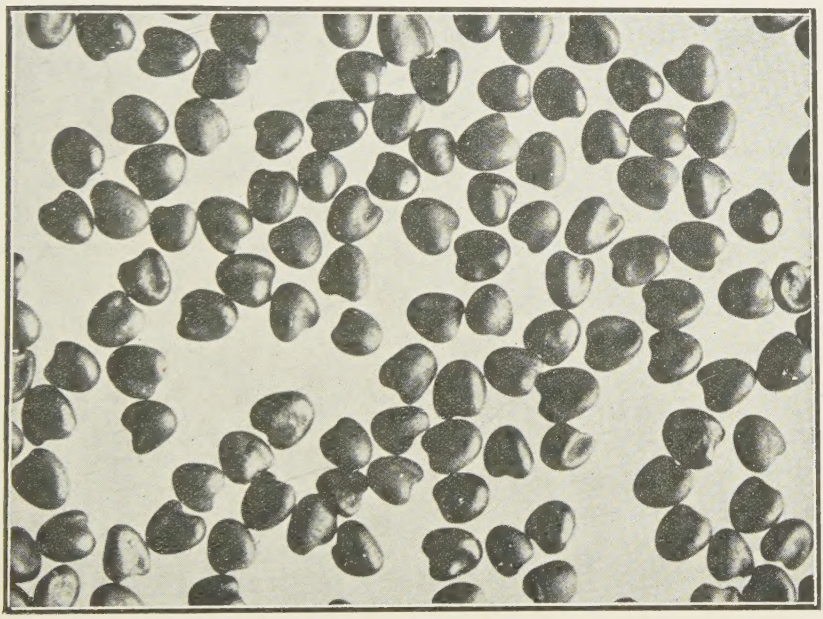
Blending of White Clover.

The highest grades of white-clover seed, comparatively speaking, are seldom found on the retail market. This is due to the fact that the farmer appears to be unwilling to pay the price at which such seed can be profitably sold. He almost invariably demands a comparatively cheap seed, and in consequence the highest-grade lines are regularly used to blend with very poor ones, and such mixed seed is offered retail at a price that is considerably lower than the wholesale price for genuine high-grade seed. This blending of different lines of white-clover seed has been practised for many years on the Continent, and is by no means uncommon in our local trade. For this condition of affairs the farmer has only himself to blame. Did he realize that the purchase of blended seed is *always* a more expensive proposition than the securing of the best quality the practice would rapidly fall into abeyance.

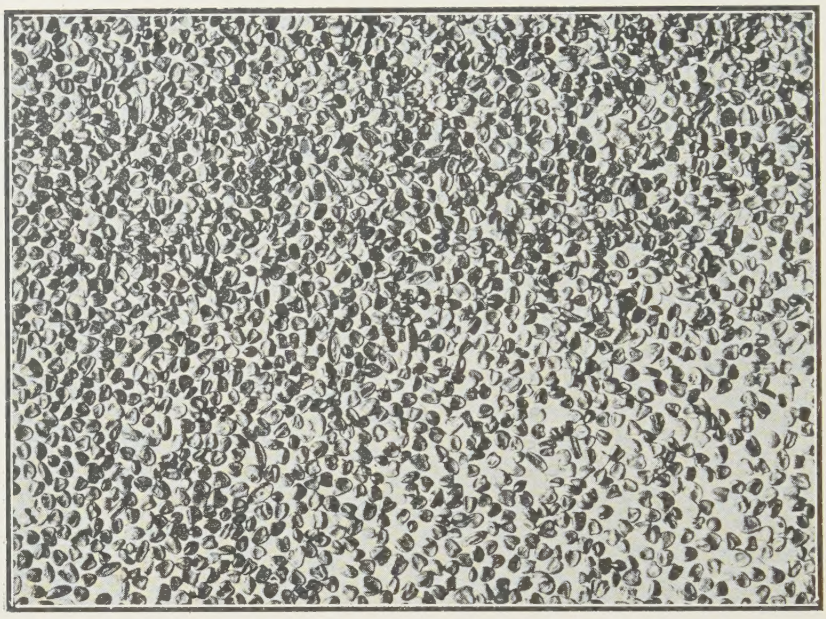
The blending of white-clover seed may be done in two ways. In the first case, a proportion of the highest-grade seed is mixed with a poorly coloured line, and the combination is sold at an apparently cheap price, which the ordinary farmer is prepared to pay. Take a typical instance where the buyer is unprepared to give more than, say, 1s. 5d. a pound for his white-clover seed. If he is lucky he will secure a line consisting of 30 per cent. of genuine white-clover seed, worth 1s. 8d. a pound, and 70 per cent. of an inferior line, worth at most 1s. 2d. a pound. It is invariably the case that the farmer thus pays more for what he actually requires than had he purchased the constituents separately and blended them himself. Even mixing is a business that costs money, and the merchant who has unfortunately been forced to adopt this practice to retain clients must necessarily protect himself by not



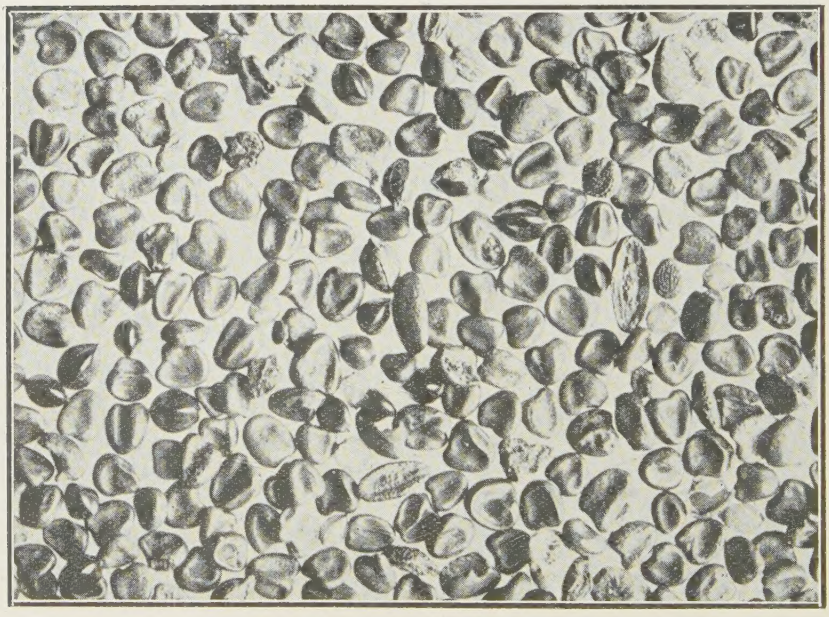
SAMPLE OF HIGH-GRADE WHITE CLOVER.
Twice Natural Size.



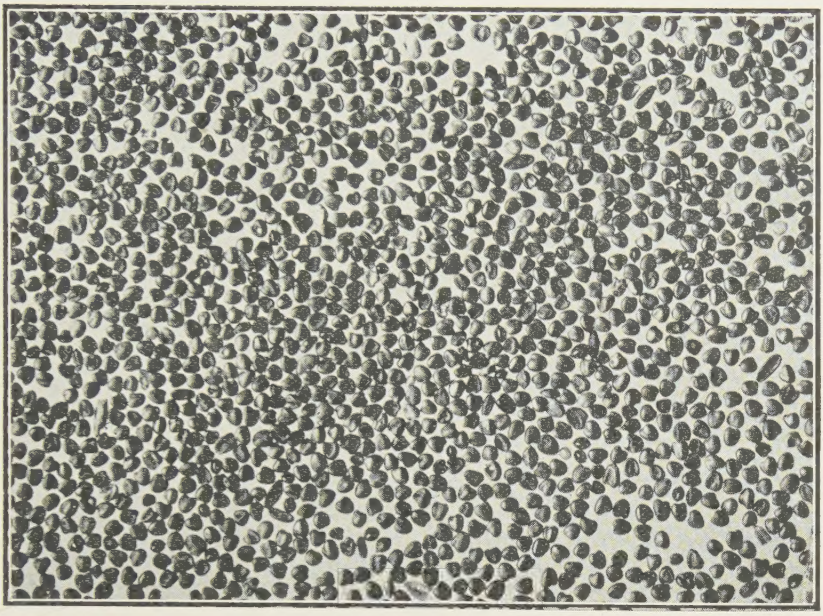
CENTRAL PORTION OF UPPER FIGURE.
Six Times Natural Size.



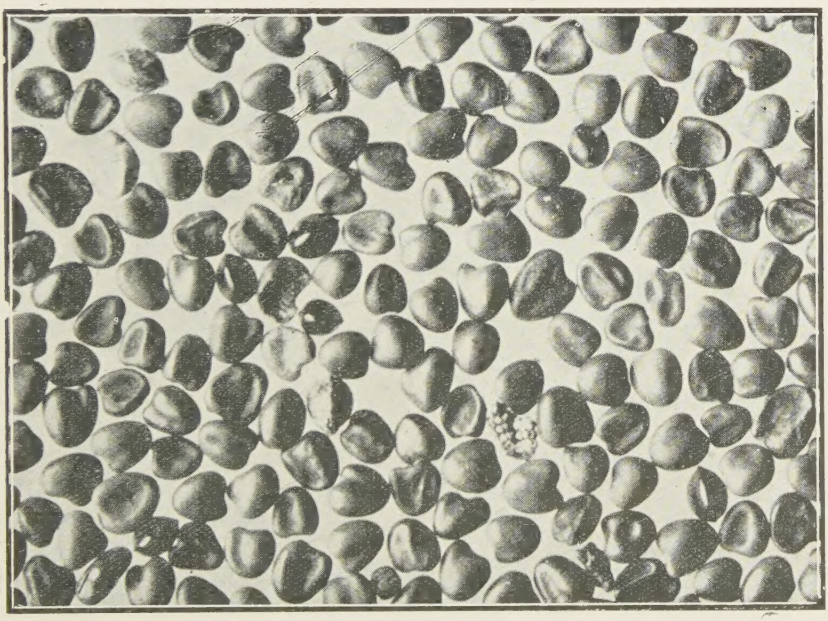
WHITE-CLOVER SECONDS.
Twice Natural Size.



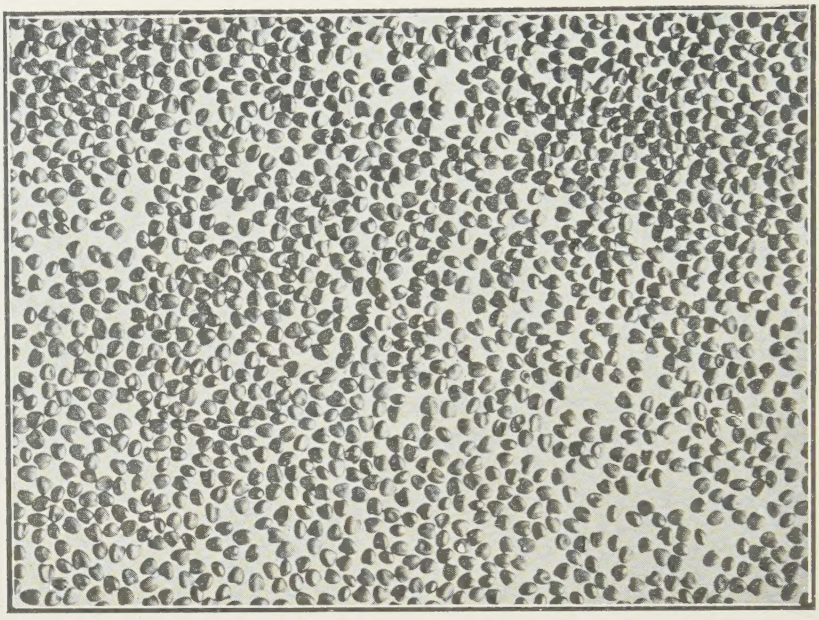
CENTRAL PORTION OF UPPER FIGURE.
Six Times Natural Size.



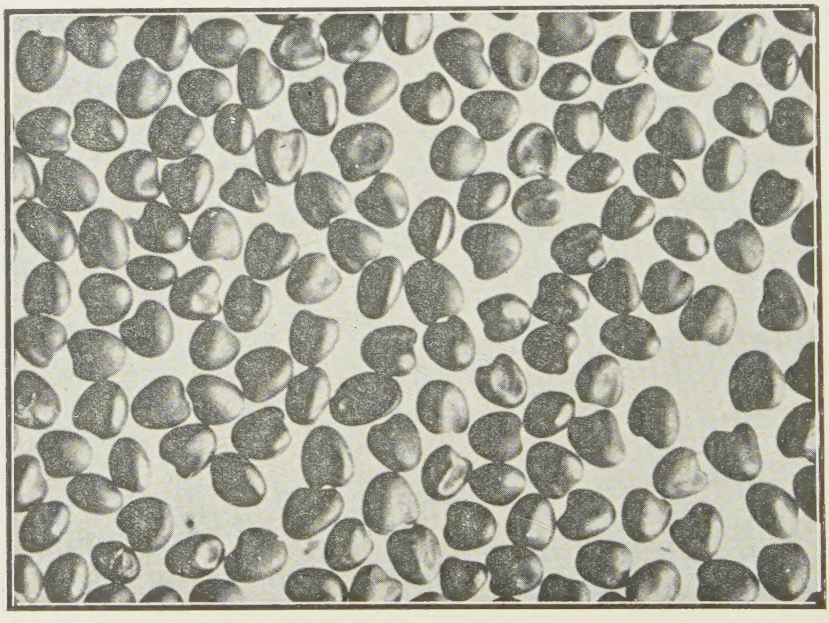
SAMPLE OF WHITE CLOVER MIXED WITH 35 PER CENT. CLOVER SECONDS.
Twice Natural Size.



CENTRAL PORTION OF UPPER FIGURE.
Six Times Natural Size.



Sample of White Clover adulterated with 25 per Cent. Suckling Clover.
Twice Natural Size.



Central Portion of Upper Figure.
Six Times Natural Size.

erring on the side of liberality in weighing out the more valuable seed in making up the mixture. In fact, the farmer is deliberately encouraging a most undesirable practice, which may easily develop into a fraudulent one, and stands to lose in more ways than one by the attempt to purchase a most important constituent of his pasture mixture at a low rate for the sake of saving a paltry 3d. or 4d. an acre in his sowing operations.

The second method of blending—and this is deliberately fraudulent—consists of the mixing of quite worthless seconds with high-grade seed. This practice is a common one on the Continent, and low-priced German seed is almost invariably of this character.

Adulteration of White Clover.

The practice of adulterating white-clover seed is a common one, and has been in vogue for many years. Formerly the regular method was to mix the seed of suckling clover with that of white clover, and to then sell the mixture as genuine seed. The amount of suckling added was generally from 10 to 30 per cent. In adulterated seed the weed-seeds are generally carefully removed, so that, apart from the adulterant, the line appears excellently dressed. Thus unless the buyer is well acquainted with the differences in appearance between the genuine seed and that of the adulterant a mixed line can easily be purchased under the impression that it is of high grade.

The main objection to suckling-clover seed as an adulterant is that its surface is much more shiny than is that of white clover, and this, combined with its not being heart-shaped, renders its detection in adulterated lines a comparatively simple matter. In some cases white-clover seed is highly polished by mechanical means, and this renders the detection of the adulterant much more difficult. This artificial polishing serves no useful purpose, and is tantamount to faking an animal for exhibition purposes. During the past few years the seed of a comparatively worthless annual clover, known as the small-flowered clover (*Trifolium parviflorum*), has been largely used in Europe in adulterating white-clover seed. The surface of the seed is duller than that of white clover, and when examined with a pocket-lens is seen to be studded with minute tubercles, and appears slightly crenellated in outline. The surface of white-clover seed, on the contrary, is perfectly smooth. Although differing slightly in size from that of white clover, the seed of *Trifolium parviflorum* is difficult to detect in mixed lines unless the sample is carefully examined. For this reason the use of it as an adulterant has become quite common in the European seed trade, but, so far, few such lines have reached the Dominion,

and the small-flowered clover has as yet not been added to our introduced flora.

Of late years one of our introduced clovers, known as "clustered clover" (*Trifolium glomeratum*), has spread over considerable areas, notably in the North Island, and large quantities of seed are frequently extracted in the cleaning of rye-grass and other pasture seeds. Clustered-clover seed is generally of a beautiful clear yellow colour, and, although smaller than that of white clover, it sufficiently resembles the latter to be used as an adulterant without much fear of being detected unless the line is very carefully examined. The seed is not quite so dull as is that of *Trifolium parviflorum*, and the surface is only slightly roughened and is not tuberculated. The very close resemblance of the seed of clustered clover to that of white clover has already been taken advantage of by certain seed-merchants, and adulterated lines are now quite common. During the past few months a large number of samples of white-clover seed containing from 15 to 40 per cent. of clustered clover have been analysed by the Department. This adulteration has no justification, and farmers are particularly advised to examine carefully any white clover they may be buying, in order to determine whether or not the line is adulterated. The presence of clustered clover helps to improve the colour of the average white-clover sample, and, as the colour largely determines the price, adulterated lines may be offered at even higher prices than pure genuine seed. The following example shows to what an extent adulteration of white-clover seed is being practised in this country at the present time. A line was purchased wholesale at £130 a ton. An analysis of the sample showed that it contained 35 per cent. of clustered clover and 20 per cent. of suckling clover. Allowing 6d. per pound for each of these, the price paid for the white-clover seed itself was a shade under 2s. per pound. Had £130 been a fair price to pay for high-grade white clover the line under discussion would have been worth, roughly, £80 a ton. In point of fact, good white clover was worth at the time of purchase considerably more than £130 a ton. Presumably the considerable amount of suckling clover present was taken into consideration, but the clustered clover was quite overlooked. The line was said to be New-Zealand-grown, and, apart from the adulterants present, was excellently cleaned, proving conclusively that the clustered and suckling clovers had been deliberately added with intent to defraud the purchaser. It is probable that the seller would say that, the line being purchased on sample, it was the purchaser's own fault if he made a bad bargain. This to a certain extent is true, but it in no way lessens the seriousness of the

fraudulent practice of selling as genuine white clover lines that have been deliberately adulterated with seed of comparatively little value.

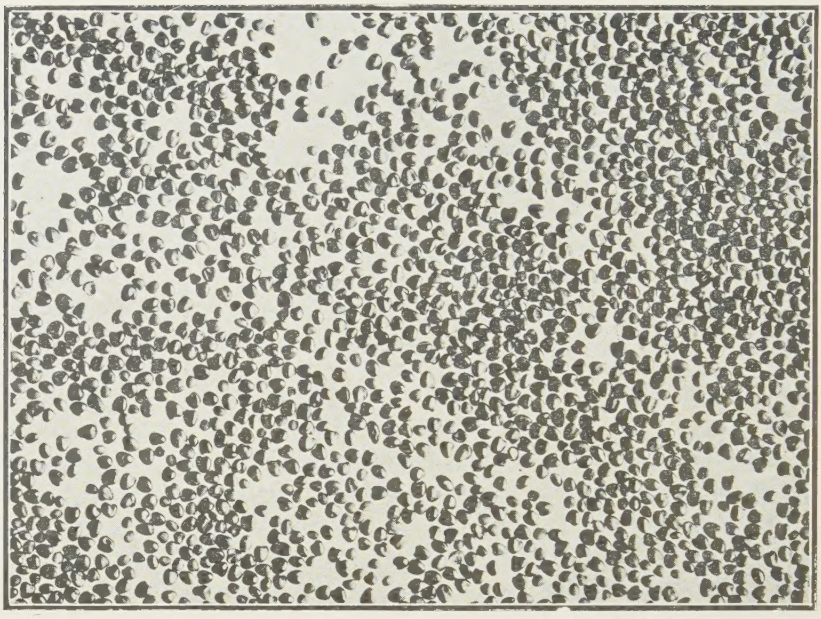
Of course, were the farmer satisfied only with genuine high-grade seed, he would have to pay considerably more a pound than if he were content with inferior adulterated seed. As shown before, however, he will in reality pay more for the actual white-clover seed in an adulterated line than when he secures pure genuine seed. This is clearly shown in the case cited, where the price paid wholesale for the white-clover seed itself was 2s. a pound, or £224 a ton, a much higher figure than would be asked retail for the very finest line of white-clover seed in the country.

Size of Seed.

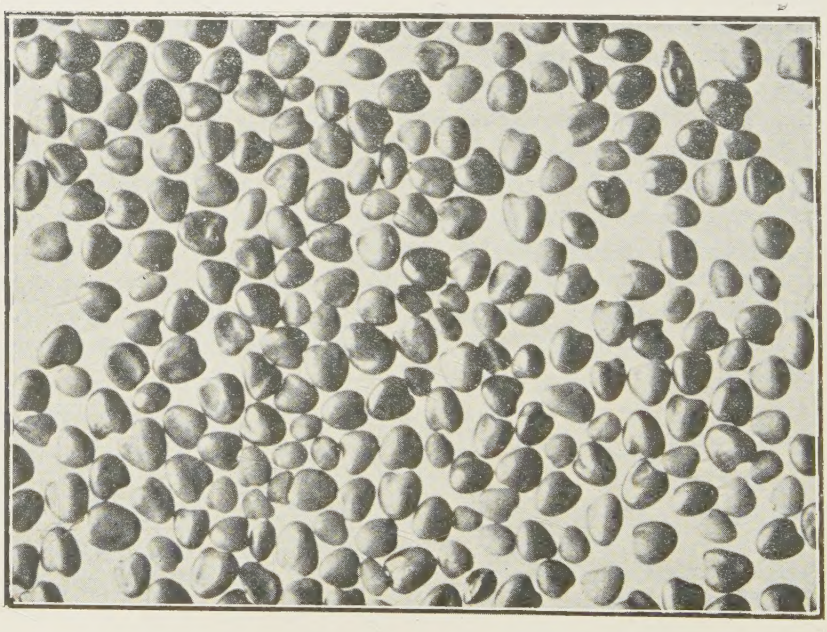
The following table gives the measurement of the seeds of white clover and those seeds that are used as adulterants. It will be noted that clustered clover has on the average the smallest seeds, while their range of variation is not as great as that of the others. The very uniform size of clustered-clover seed renders its extraction quite a simple matter, and there is thus no excuse for this clover to ever be an impurity in machine-dressed clover-seed even though it were abundant in the undressed line. In fact, its presence in machine-dressed seed is always indicative of adulteration having been practised. With the small-flowered and suckling clovers their seeds vary considerably in size, and the largest are in many cases bigger than are the smallest seeds of white clover, so that their complete extraction would result in a considerable amount of the white-clover seed being lost. For this reason with certain lines of undressed white-clover seed only a proportion of the suckling is cleaned out, due to the seeds being slightly larger than the average. Dressed samples containing from 3 to 6 per cent. of suckling are not uncommon, but these cannot be looked upon as adulterated. Where the percentage of suckling exceeds 10 per cent. it is fairly obvious that the line has been deliberately adulterated.

Seed.	Length.		Breadth.		Average Size.	
	Maximum.	Minimum.	Maximum.	Minimum.	Length.	Breadth.
	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.
Small-flowered clover (*Trifolium parviflorum*)	1·44	0·90	1·02	0·72	1·13	0·85
Clustered clover (*Trifolium glomeratum*)	1·14	0·84	0·96	0·72	0·97	0·84
White clover (*Trifolium repens*) ..	1·62	1·08	1·26	0·90	1·27	1·13
Suckling clover (*Trifolium minus*) ..	1·50	0·90	1·02	0·72	1·23	0·88

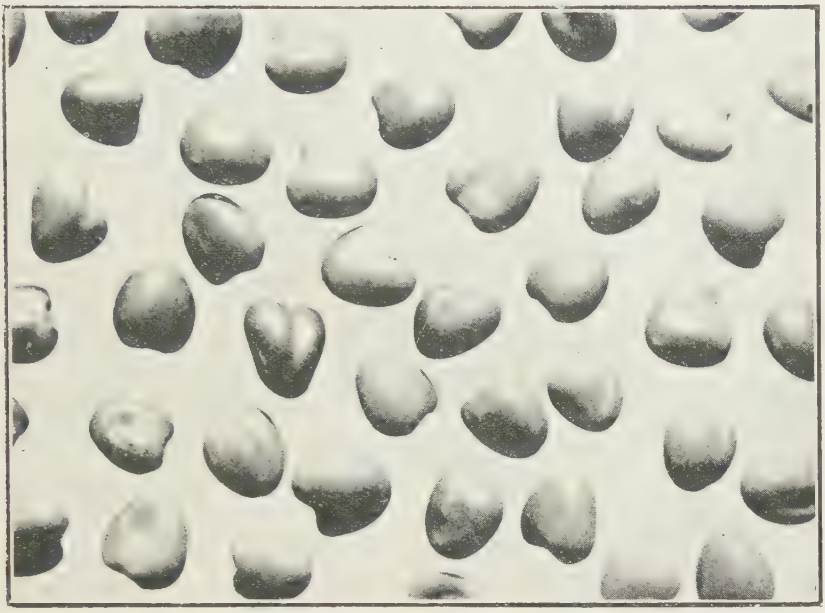
Mm. (millimeter) = ·04 in.



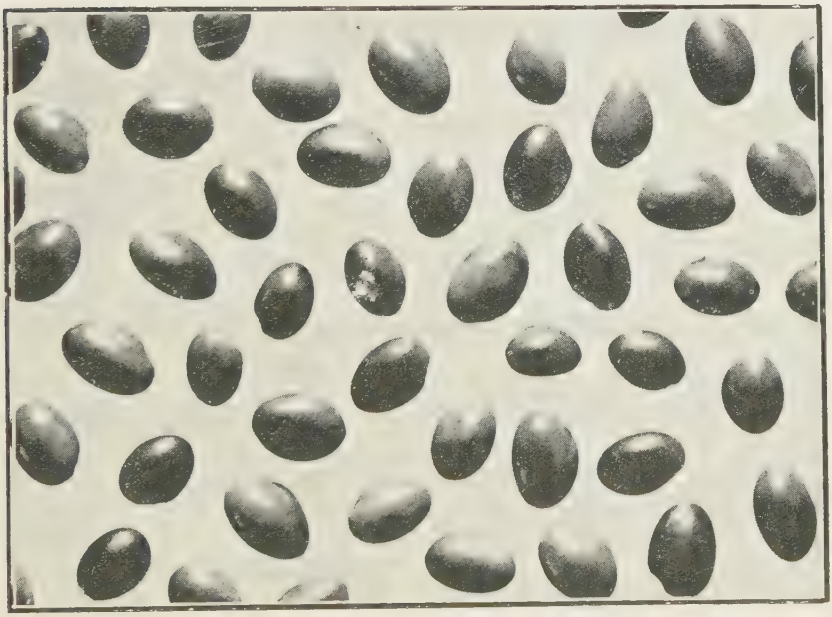
Sample of White Clover adulterated with 25 per Cent. of Clustered Clover.
Twice Natural Size.



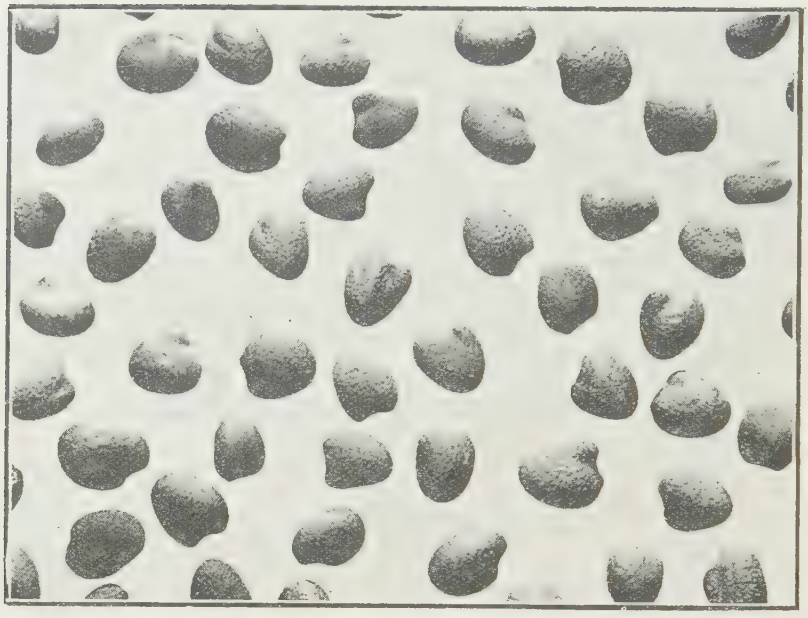
Central Portion of Upper Figure.
Six Times Natural Size.



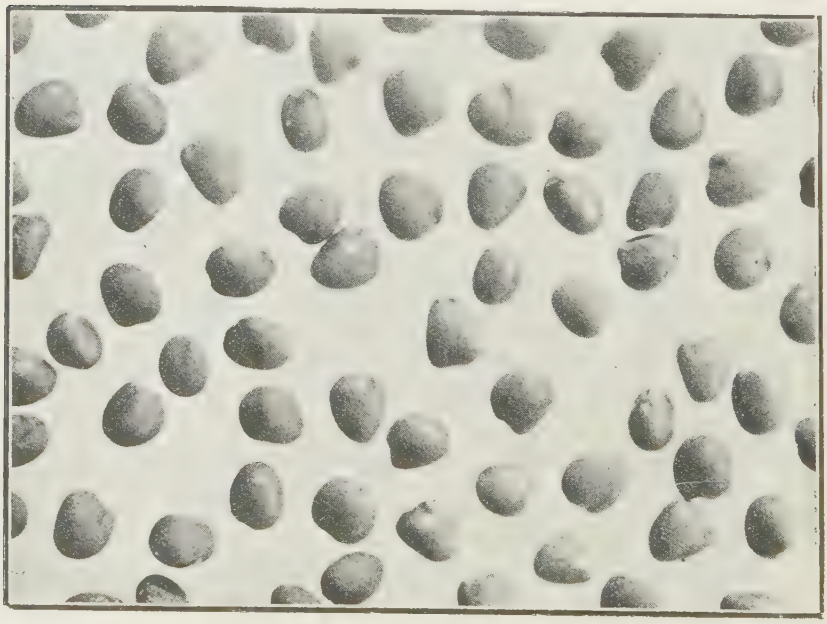
White Clover (Trifolium repens).
Ten Times Natural Size.



Suckling Clover (Trifolium minus).
Ten Times Natural Size.



Clustered Clover (Trifolium glomeratum).
Ten Times Natural Size.



Small-flowered Clover (Trifolium parviflorum).
Ten Times Natural Size.

Detecting Adulteration.

As previously mentioned, the detection of adulteration is rather a difficult matter to the ordinary farmer. Yet were the farmer to have more confidence in his powers of observation, and study with the aid of a small magnifying-glass his lines of seed, he would soon acquire a certain degree of facility in detecting and recognizing at a glance impurities and adulterants. When in doubt he has the Department's assistance at his command.

The difference between white-clover seed and its common adulterants is clearly shown in the illustrations which accompany this text.

Lines adulterated with suckling clover can be immediately recognized by the generally darker colour, the extreme shininess of the seeds, and more rounded form of the adulterant. Those to which clustered-clover seed has been added can be immediately detected by sieving the sample through a sieve having holes of an aperture of 1 millimeter (·04 in.) in diameter, when all the clustered-clover seed will pass through, leaving the genuine white-clover seed in the sieve. I would strongly advise all seed-merchants to procure a sieve of this size, so that "selling samples" may be tested at once for the above adulterant. This sieve will also be found useful in roughly estimating the amount of suckling present, as the smaller seeds of this clover pass through along with those of the clustered variety. When a suitable sieve is not available the clustered-clover seeds may be recognized by their dull surface and smaller form.

So far as the small-flowered clover is concerned, the tuberculated appearance of its surface when magnified renders its identification comparatively simple; but, as stated before, lines adulterated with this clover are seldom met with in this country.

Descriptions of Seeds.

Trifolium parviflorum.—Shape: In general of the conventional heart-shape, somewhat flattened, though slightly less than *Trifolium repens*. *Surface:* Variable in colour; each face regularly marked, with a groove running between the radical and the cotyledon sides of the seed. It has a decidedly dull surface, being finely roughened and thickly studded with minute tubercles. Under a lens (× 12) these tubercles are clearly seen, and give, particularly to the outline of this seed, an irregularity not apparent in *glomeratum* and the other two species.

Trifolium glomeratum.—Shape: Inclined to be heart-shaped; sides somewhat flattened, but more rounded than *repens* and *parvi-*

florum. Surface: Of comparatively uniform colour; almost the same shade as the brightest yellow seeds of *repens*. Each face marked slightly with a groove. The surface is decidedly dull, being finely roughened, a character which, together with its smaller size, facilitates its identification when mixed with *repens*, the surface of which is very smooth to slightly shining.

Trifolium repens.—Shape: In general heart-shaped and flattened. *Surface:* Variable in colour, each face usually bearing a slight groove. The surface is very smooth to slightly shining.

Trifolium minus.—Shape: Is not heart-shaped and flattened like *repens* and the other two species; it is oval, and its two faces are well rounded. *Surface:* Very variable in colour. Unlike the other three, its two faces are only very occasionally marked by a distinct groove. Its surface is naturally very highly polished. *Repens*, the next most shining of the four, except when artificially polished, has a very smooth rather than a shining surface.

The photographs illustrating this article are the work of Mr. E. B. Levy, of the Biologist's Staff.

Dock-eradication.—My neighbour, Mr. G. R. Scott, and myself have found that if docks are allowed to grow big and tall, and cut either with a scythe or grub-hoe close to the ground, a good sprinkling of salt or kainit will generally kill them. They are only troublesome in grass kept for hay, as in pastures stock will keep them down.—*H. L. Squires, Parua Bay.*

Cheap Limestone.—The footnote to my article on "Limestone" in the April number (p. 390) of this *Journal* has in one instance at least borne fruit. A reader obtained three trucks of 6 tons each at 12s. per truck from the Mauriceville (Wairarapa) Lime-kilns. The stuff was the coarse limestone produced in quarrying, but was too fine to go in the kilns, and consisted of some lumps up to the size of a man's fist, with smaller lumps and powder. The limestone was carried free for 100 miles on the railway, and was carted about a mile from the railway-station to the farm, where it was screened through a quarter-inch mesh, through which about two-thirds of the material passed. There was thus left about 12 tons of fine limestone, which was applied to the land at the rate of from 3 tons to 5 tons per acre, at a cost, including cartage and handling, of approximately 6s. per ton, on the land.—*B. C. Aston.*

FORAGE PLANTS AND ANIMAL NUTRITION.

A. McTaggart, B.S.A., M.S.A.

Science has demonstrated the existence of certain characteristics peculiar to races as well as varieties in both the plant and animal kingdoms. Not the least distinguished of her achievements in this direction has been that of determining, by patient, exacting research work, that subtle but most important characteristic of various plants of agricultural importance—the nutritive value. The purpose of this article is to place before farmers some of the results of this valuable work, showing by calculations and deductions made therefrom how they can be interpreted and made serviceable to those engaged in agricultural and pastoral pursuits.

The following tables have been collaborated by Henry, the American authority on feeds and feeding, from the work of Dietrich and König, Wolff, Woll, Voorhees, Roberts, and others. They represent the results of careful digestive experiments with ruminants, many tests being made with definite weights of the grasses and forage crops enumerated and averages taken thereof. From this data we have calculated the nutritive ratios, these representing the ratios between the digestible crude protein on the one hand and the digestible nitrogen-free materials of the nature of carbohydrates on the other hand. The various figures are to be taken as approximations, and when taken comparatively in the column the approximate relative values of the various grasses, &c., can be gauged. The nutritive ratio provides a reasonably good idea of the feeding-value of the grass or forage plant, but the productive and maintenance values (shown below as figures from the more complete tables of Kellner, the eminent agricultural scientist) furnish the farmer with more accurate information as to the comparative potentialities of the various crops. A narrow nutritive ratio, as for instance hairy vetch (in bloom), 1 : 2·39, means a highly nutritive fodder per given weight, while a wide nutritive ratio, as for instance wild oat, 1 : 18·14, means a low nutritive fodder per corresponding weight. The "balanced ration" on the average for ruminant animals is 1 : 8 to 10, from which the approximate value of each of the above for effective production can be gauged. It has been found by Kellner that when a fodder fed to a ruminant animal contains on the one hand 1 part of digestible crude protein and on the other 8 to 10 parts of digestible carbohydrates (starches, sugars, &c.) — that is, a nutritive ratio of 1 : 8 to 10 — the fullest

Digestible Nutrients and Fertilizing Constituents in Grasses, etc.

	Total Dry Matter in 100 lb.	Digestible Nutrients in 100 lb.			Nutritive Ratio.	Fertilizing Constituents in 1,000 lb.		
		Crude Protein.	Carbo-hydrates.	Fat		Nitrogen.	Phosphoric Acid.	Potash.
Fresh Green Grasses.	lb.	lb.	lb.	lb.		lb.	lb.	lb.
Kentucky blue-grass	34·9	2·8	19·7	0·8	1 : 7·69	6·6	..	..
Timothy	38·4	1·5	19·9	0·6	1 : 14·18	5·0	2·6	7·6
Cocksfoot (orchard-grass)	27·0	1·2	13·4	0·5	1 : 12·12	4·2	1·6	7·6
Red-top (in bloom)	34·7	1·9	21·3	0·5	1 : 11·81	4·5	..	..
Meadow fescue	30·1	1·6	18·6	0·5	1 : 12·34	3·8	..	..
Italian rye-grass	26·8	1·5	12·6	0·7	1 : 9·47	5·0	2·9	11·4
Tall oat-grass	30·5	1·2	15·7	0·5	1 : 14·04	3·8	..	..
Johnson grass	25·0	0·6	13·7	0·2	1 : 23·60	1·9	..	..
Bermuda grass	28·3	1·3	13·4	0·4	1 : 11·01	3·5	..	..
Hungarian grass	28·9	2·0	15·9	0·4	1 : 8·41	5·0	1·2	4·2
Japanese millet	25·0	1·1	13·6	0·3	1 : 12·99	3·4	2·0	3·4
Barnyard millet	25·0	1·6	14·4	0·3	1 : 9·43	3·8	1·1	5·8
Pearl millet	18·5	0·6	10·0	0·2	1 : 17·43	1·9	1·5	7·1
Common millet	20·0	0·8	11·0	0·2	1 : 14·32	2·4	0·7	4·7
Red clover	29·2	2·9	13·6	0·7	1 : 5·24	7·0	1·5	4·8
Mammoth red clover (cow-grass) ..	20·0	2·0	9·1	0·2	1 : 4·78	4·8	..	..
Alsike clover	25·2	2·6	11·4	0·5	1 : 5·82	6·2	1·1	2·0
Crimson clover	19·1	2·4	9·1	0·5	1 : 4·27	5·0	1·2	4·0
Sweet clover (Bokhara)	20·0	2·5	8·4	0·4	1 : 3·72	6·1	2·4	6·7
Alfalfa (lucerne)	28·2	3·6	12·1	0·4	1 : 3·61	7·7	1·3	5·6
Spring vetch	15·0	1·9	6·6	0·2	1 : 3·71	4·3	1·0	4·5
Cow-pea	16·4	1·8	8·7	0·2	1 : 5·08	3·8	1·3	4·6
Hairy vetch (winter)	15·0	2·8	6·4	0·3	1 : 2·53	5·8	1·4	5·2
Hairy vetch (in bloom)	18·0	3·5	7·7	0·3	1 : 2·39	6·7	..	..
Soya bean	24·9	3·1	11·0	0·5	1 : 3·91	6·4	1·4	5·6
Serradella	20·5	2·1	8·9	0·4	1 : 4·67	4·3	1·6	5·5
Horse-bean	15·8	2·3	7·3	0·2	1 : 3·37	4·5	0·5	2·1
Velvet bean	17·8	2·7	8·4	0·4	1 : 3·45	5·6	..	..
Sainfoin	25·0	2·9	11·1	0·5	1 : 4·22	7·0	1·4	5·7
Canada field pea	15·3	1·8	6·9	0·3	1 : 4·21	4·5	1·6	5·0
Mixed grasses and clover	25·0	2·3	14·6	0·5	1 : 6·84	4·6	..	..

Cured Hay from Grasses, &c.									
Timothy (all analyses)	86·8	2·8	42·4	1·3	1 : 16·21	9·4	3·3	14·2
Meadow foxtail	93·4	5·3	41·0	1·3	1 : 8·30	14·9	..	..
Cocksfoot (orchard-grass)	90·1	4·9	42·1	1·4	1 : 9·31	12·9	3·7	16·9
Red-top	91·1	4·8	40·9	1·0	1 : 10·25	12·6	3·6	10·2
White-top	86·0	6·8	40·6	1·5	1 : 6·47	17·9	..	..
Meadow fescue	80·0	4·2	36·6	1·5	1 : 9·60	11·2	4·0	21·0
Kentucky blue-grass	86·0	4·1	40·2	0·7	1 : 9·50	12·5	4·0	15·7
Tall oat-grass	86·0	3·3	41·4	1·1	1 : 13·00	10·3	..	..
Italian rye-grass	91·5	4·5	13·4	0·9	1 : 10·10	12·0	7·6	24·6
Perennial rye-grass	86·0	6·1	37·8	1·2	1 : 6·65	16·2	7·4	24·1
Bermuda grass	92·9	6·4	44·9	1·6	1 : 7·59	17·1	..	..
Johnson grass	89·8	2·9	45·6	0·8	1 : 16·35	11·5	..	..
Barnyard millet	86·0	5·2	38·6	0·8	1 : 7·77	16·9	4·3	28·8
Hungarian grass	86·0	5·0	46·9	1·1	1 : 9·88	12·1	4·3	15·4
Wild oat-grass	85·7	2·9	48·7	1·7	1 : 18·14	8·0	..	..
Prairie-grass	90·8	3·0	42·9	1·6	1 : 15·52	9·9	..	..
Buffalo-grass	85·0	3·0	42·0	1·6	1 : 15·22	7·1	..	..
Guinea grass	..	3·3	47·2	0·5	1 : 14·65	8·8	..	..
Australian salt-bush	93·0	3·8	28·8	0·7	1 : 8·00	18·6	5·9	21·3
Red clover	84·7	7·1	37·8	1·8	1 : 5·90	19·7	5·5	18·7
Mammoth red clover	78·8	6·2	34·7	2·1	1 : 6·37	17·1	5·2	11·6
Alsike clover	90·3	8·4	39·7	1·1	1 : 5·02	20·5	5·0	13·9
White clover	90·3	11·5	42·2	1·5	1 : 3·90	25·1	7·8	13·2
Crimson clover	90·4	10·5	34·9	1·2	1 : 3·58	24·3	4·0	13·1
Japan clover	89·0	9·1	37·7	1·4	1 : 4·49	22·1	..	..
Sweet clover (Bokhara)	92·1	11·9	36·7	0·5	1 : 3·18	28·8	5·6	18·3
Soya bean	88·2	10·6	40·9	1·2	1 : 4·12	23·8	..	..
Cow-pea	89·5	9·2	39·3	1·3	1 : 4·59	14·3	5·2	14·7
Alfalfa (lucerne)	91·9	10·5	40·5	0·9	1 : 4·05	23·4	6·1	17·9
Alfalfa-leaves	95·1	16·8	35·9	1·3	1 : 2·31	37·3	..	..
Bur clover	91·0	8·2	39·0	2·1	1 : 5·34	21·8	..	..
Hairy (winter) vetch	88·7	11·9	40·7	1·6	1 : 3·72	27·2	9·7	24·4
Serradella	90·8	11·4	38·6	1·7	1 : 3·72	24·3	7·4	26·3
Pea-vine	92·4	6·7	42·2	3·0	1 : 7·32	17·1	3·2	11·6
Velvet bean	90·0	9·6	52·5	1·4	1 : 5·80	22·4	..	..
Florida clover	90·8	6·8	42·8	1·6	1 : 6·83	18·9	..	..
Sainfoin	85·0	10·4	36·5	2·0	1 : 3·95	23·7	5·0	14·7
Mixed grasses and clover	87·1	5·8	41·8	1·3	1 : 7·72	16·2	..	..

possible digestion (hence nutrition) is taking place. If the carbohydrates are increased a certain portion of these nutrients go into the excrement, and if the starches and sugars are still further increased a point is reached when the animal neither gains nor loses in weight—receives a maintenance ration. Within certain limits the increase of crude protein in a food causes not only no depression of digestibility of the other components, but, on the contrary, minimizes the depressing effect of large quantities of nitrogen-free substances (carbohydrates, &c.). The addition of non-protein nitrogenous substances (amides, amido acids, &c.) acts similarly to the protein, and raises the digestibility when it is depressed by large doses of carbohydrates. Beyond the "balanced ration" limit, however, with an increase of crude protein there is also a tendency for a certain portion of this substance to pass into the excrement—that is, full assimilation of the crude protein does not take place. More particularly is this so with mature animals. Thus for maximum body nutrition and increase combined a balanced ration is required, this varying with the type of animal fed; but for ruminants in general a ration possessing a nutritive ratio of 1 : 8 to 10. For pigs less protein is necessary, and may be placed at 1 part to 12 carbohydrates.

The tables shown on the following pages (334 and 335) give the detailed results of careful nutrition experiments performed by Kellner, whose work in this direction was unique. From his figures we have calculated the productive and maintenance values by use of the method provided by Warrington, one-time chemist at the Rothamsted Experimental Station. A comparison of the figures within each column will indicate the productive and maintenance values respectively of these various forage plants and crops. The productive value means the actual value, expressed in terms of starch, for purposes of increase; whereas the maintenance value means the actual value, in the terms of starch, for the purposes of maintaining the animal—preventing neither increase nor decrease in weight. Naturally a fodder would possess a higher maintenance value than productive. From these tables the nutritive ratios and albuminoid ratios have also been calculated. Here the nutritive ratios in some instances differ slightly from those calculated from the tables collaborated by Henry, but when taken comparatively again in the column the relative nutritive values of not only the same crops but others not appearing in the former tables can be gauged. The albuminoid ratio is the ratio between the digestible protein on the one hand and the digestible substances of the nature of carbohydrates on the other. It is thus a wider ratio than the nutritive ratio; and it has been calculated here (from the tables of Henry its calculation could not be made) for purposes of the

interpretation of the particulars which follow respecting ratios prescribed for the effective feeding of various types of animals.

Kellner in his extensive investigation work brings out various significant facts respecting the requirements of different classes of stock. Fully grown animals have clearly not the power of increasing their store of protein, or flesh, beyond certain limits. An examination of the fibres of the flesh shows that it is only in youth that they can increase, and that a limit to the increase in thickness is also set. In other ways, too, it is clear that the store of flesh in an animal can only be increased to a small extent. In fattening grown animals, however, there is a considerable margin left in the quantity of digestible protein (flesh-former) which may be fed. If the animals, at the beginning of the fattening period are in a moderate condition, a commencement may be made with the wide nutritive or the albuminoid ratio. Lean, worn-out animals put aside to be fattened require a much narrower ration (richer in protein), so that the fibres of the flesh develop and are able to store up large quantities of fat. For two to four weeks the ration should be moderately rich in protein (albuminoid ratio 1 : 6), and as the fattening proceeds the amount of protein can be slowly diminished. A large number of investigations have proved that with the very moderate quantity of protein excellent results can be obtained.

When the rate at which young animals lay on flesh and mineral substances is considered it is easy to understand, Kellner states, how some have thought that the maintenance requirements are less during growth than later, and that with young cattle the food has greater productive value. Investigations carried on from several standpoints have, however, taught that metabolism (body-building processes) in the young body is at least as much and perhaps more than when growth has ceased, but that the protein and mineral substances in excess of maintenance requirements can be utilized to a much greater extent for the development of the growing organs. The growing animal, then, posesses an extraordinary power of incorporating the proteins which are offered to it, and this it only loses gradually. As with protein, so also with the mineral substances which are necessary for the formation of the important vital organs. A fairly narrow ration and one well supplied with minerals (phosphorus, potash, lime, magnesia) is required, then, for young growing animals. Under natural conditions young pasture well supplied with clovers meets this condition, the clovers being rich in protein, together with the fact that the plant is relatively richer in mineral substances in the early stages of growth—hence young pasture is well supplied with these essentials, and thus specially supplies the flesh- and bone-building needs of the young growing animal.

Composition, Digestibility, and Starch Equivalents.

Grasses.	Crude Nutrients.						Digestible Nutrients.				Value (full value, 100 lb.).	Digestible Protein.	Starch Equivalent (per 100 lb.).	Production Value. Actual Value of 100 lb. expressed as Starch.	Maintenance Value. Actual Value of 100 lb. expressed as Starch.	Nutritive Ratio.	Albuminoid Ratio.
	Water.	Crude Protein.	Crude Fat.	Nitrogen-free Extract.	Crude Fibre.	Ash.	Crude Protein.	Crude Fat.	Nitrogen-free Extract.	Crude Fibre.							
	%	%	%	%	%	%	%	%	%	%		%					
Millet	87·0	1·3	0·2	6·2	4·1	1·2	0·7	0·1	3·8	2·2	82	0·4	5·4	4·43	6·91	1 : 8·90	1 : 15·57
Cocksfoot (before and after flowering)	79·6	2·3	0·7	10·7	4·8	1·9	1·5	0·4	7·6	3·0	89	0·5	10·7	9·32	12·94	1 : 7·68	1 : 14·40
Maize (American) ..	82·8	1·4	0·4	9·9	5·0	1·5	9·7	0·2	5·5	2·7	82	0·3	7·3	6·26	9·27	1 : 12·37	1 : 28·86
,, (European seed) ..	80·6	1·7	0·5	10·4	5·6	1·2	1·0	0·3	6·7	3·1	83	0·6	9·1	7·99	10·19	1 : 10·49	1 : 17·48
Rye-grass (in bloom). English	75·2	2·9	0·7	11·5	7·1	2·6	1·8	0·3	7·4	4·0	81	1·3	10·6	9·39	14·01	1 : 6·71	1 : 9·30
,, ,, Italian	75·0	3·4	1·0	11·6	6·2	2·8	2·1	0·5	7·7	3·6	85	1·3	11·4	10·15	14·55	1 : 5·92	1 : 9·59
Rye fodder	76·6	3·0	0·9	10·3	7·5	1·7	2·1	0·5	7·0	4·9	80	1·4	11·3	9·55	15·22	1 : 6·21	1 : 9·32
Timothy (in flower) ..	66·9	3·1	1·0	17·6	9·2	2·2	1·6	0·5	11·1	4·8	79	1·0	14·0	13·25	18·66	1 : 10·65	1 : 17·05
Sorghum (sugar) ..	80·1	2·1	0·6	9·6	6·2	1·4	1·2	0·2	5·8	3·3	79	0·7	8·1	6·96	10·73	1 : 8·11	1 : 13·91
Red clover (full flower) ..	79·0	3·4	0·7	9·4	5·9	1·6	2·2	0·4	6·7	2·6	83	1·7	9·7	9·32	12·64	1 : 4·64	1 : 6·01
Incarnate clover (in bloom)	81·5	2·8	0·7	7·0	6·2	1·9	2·1	0·5	5·2	3·5	81	1·5	9·0	7·85	12·08	1 : 4·69	1 : 6·56
White clover (beginning of flowering)	81·5	4·4	0·8	6·9	4·3	2·1	2·8	0·5	4·7	2·6	88	1·9	8·8	7·75	11·36	1 : 3·02	1 : 4·44
Lucerne (before flowering)	76·0	4·5	0·8	9·6	6·8	2·3	3·2	0·4	6·3	2·9	79	1·7	9·1	8·92	13·14	1 : 3·16	1 : 5·95
,, (full flower) ..	76·0	3·9	0·8	9·3	7·8	2·2	2·7	0·4	5·7	3·5	74	1·5	8·4	8·12	12·71	1 : 3·74	1 : 6·74
Sainfoin (full flower) ..	80·0	3·5	0·6	7·8	6·9	1·2	2·3	0·3	4·8	3·2	76	1·6	7·6	7·09	11·11	1 : 3·77	1 : 5·43
Serradella (full flower) ..	82·3	3·2	0·7	7·3	5·1	1·4	2·1	0·5	4·0	2·5	82	1·5	7·3	6·65	9·88	1 : 3·64	1 : 5·10
Bokhara clover (in flower)	79·7	4·1	0·8	7·4	5·7	2·3	2·6	0·4	5·0	2·8	81	1·6	8·2	7·52	11·32	1 : 3·35	1 : 5·45
Hop trefoil (beginning of flowering)	80·0	3·5	0·8	8·4	5·7	1·6	2·4	0·4	5·9	2·8	83	1·6	9·1	8·42	12·10	1 : 4·00	1 : 6·01
Kidney vetch	82·0	2·4	0·6	8·6	5·1	1·3	1·4	0·3	5·7	2·7	83	0·6	7·9	6·99	10·32	1 : 6·50	1 : 15·15
Field beans (beginning of flowering)	85·0	3·2	0·8	5·7	3·3	2·0	2·3	0·5	4·1	1·6	88	1·5	7·1	6·75	9·20	1 : 2·98	1 : 4·56
Peas (beginning of flowering	84·6	4·0	0·5	5·1	4·5	1·4	2·9	0·3	3·2	2·3	83	1·9	6·6	5·79	9·16	1 : 2·13	1 : 3·25
Vetches (in flower) ..	82·5	3·2	0·5	7·2	5·1	1·5	2·2	0·3	4·9	2·3	83	1·4	7·5	6·99	10·12	1 : 3·58	1 : 5·63
Lupins (end of flowering) ..	83·1	3·2	0·4	7·0	5·3	1·0	2·1	0·2	4·0	3·6	81	0·8	7·1	5·26	9·84	1 : 3·83	1 : 10·07
Field peas	83·2	3·5	0·6	5·6	5·9	1·2	2·4	0·3	3·7	3·0	77	1·6	6·8	5·99	9·87	1 : 3·07	1 : 4·61

COMPOSITION, DIGESTIBILITY, AND STARCH EQUIVALENTS—*continued.*

Grasses.	Crude Nutrients.						Digestible Nutrients.									Nutritive Ratio.	Albuminoid Ratio.
	Water.	Crude Protein.	Crude Fat.	Nitrogen-free Extract.	Crude Fibre.	Ash.	Crude Protein.	Crude Fat.	Nitrogen-free Extract.	Crude Fibre.	Value (full value, 100 lb.).	Digestible Protein.	Starch Equivalent (per 100 lb.).	Production Value. Actual Value of 100 lb. expressed as Starch.	Maintenance Value. Actual Value of 100 lb. expressed as Starch.		
Cured Hay.	%	%	%	%	%	%	%	%	%	%		%					
Rye-grass (in flower). English	14·3	10·2	2·7	30·1	30·2	6·5	**5·1**	**0·8**	**19·9**	**15·4**	56	3·3	22·5	25·04	42·34	**1 : 7·28**	1 : 11·25
,, ,, Italian	14·3	11·2	3·2	40·6	22·9	7·8	**7·1**	**1·4**	**26·6**	**14·9**	73	4·9	35·6	34·72	46·16	**1 : 6·31**	1 : 9·12
Timothy hay	14·3	8·5	2·4	41·1	28·5	5·2	**4·0**	**1·0**	**25·5**	**15·1**	64	3·2	29·1	31·00	47·38	**1 : 10·72**	1 : 13·40
Red clover (good) ..	16·5	13·5	2·9	37·1	24·0	6·0	**8·5**	**1·7**	**26·0**	**11·3**	70	5·5	31·9	35·41	49·88	**1 : 4·84**	1 : 7·49
Lucerne (before flowering)	16·0	16·2	2·4	31·1	27·0	7·3	**12·1**	**1·1**	**21·1**	**11·3**	63	8·1	26·5	31·73	47·45	**1 : 2·88**	1 : 4·31
,, (in flower) ..	16·5	14·2	2·6	29·2	29·5	8·0	**9·7**	**1·2**	**18·1**	**13·2**	57	6·2	22·4	27·06	43·91	**1 : 3·51**	1 : 5·49
Sainfoin (in flower) ..	16·5	13·2	2·5	32·5	28·0	7·3	**9·6**	**1·6**	**25·3**	**11·8**	66	7·5	31·1	36·48	51·41	**1 : 4·24**	1 : 5·43
Hop trefoil	16·0	15·4	3·4	33·2	24·5	7·5	**11·8**	**1·6**	**23·2**	**10·8**	69	8·6	31·0	35·48	50·35	**1 : 3·19**	1 : 4·38
Birdsfoot trefoil ..	12·5	13·5	3·0	41·7	22·5	6·8	**7·4**	**1·5**	**27·1**	**11·2**	72	5·1	33·0	35·65	49·50	**1 : 5·64**	1 : 8·18
Incarnate clover ..	16·7	12·0	2·4	35·5	26·2	7·2	**8·3**	**1·0**	**23·1**	**12·3**	64	5·5	27·4	30·90	46·25	**1 : 4·54**	1 : 6·85
Serradella	16·0	15·2	3·0	33·2	25·6	6·8	**11·4**	**2·0**	**20·9**	**12·8**	68	9·2	31·4	30·56	51·12	**1 : 3·35**	1 : 4·16
Bokhara clover	15·7	16·7	2·8	27·9	30·3	8·0	**8·5**	**1·6**	**18·1**	**13·6**	55	4·4	21·4	26·18	43·34	**1 : 4·16**	1 : 8·04
White clover (in flower) ..	16·0	14·9	3·6	35·7	23·1	6·7	**8·5**	**2·1**	**25·0**	**11·8**	71	4·9	32·1	34·73	49·91	**1 : 4·89**	1 : 8·48
Kidney vetch (in flower) ..	16·0	10·2	2·2	36·5	29·0	6·1	**6·1**	**1·0**	**23·7**	**14·2**	62	4·9	27·7	30·90	47·04	**1 : 6·59**	1 : 8·20
Peas (in flower)	16·7	14·3	2·6	34·2	25·2	7·0	**9·4**	**1·6**	**20·5**	**12·6**	66	6·6	27·8	30·78	46·71	**1 : 3·91**	1 : 5·57
Vetches (in flower) ..	16·7	14·2	2·5	32·8	25·5	8·3	**9·4**	**1·5**	**19·7**	**12·8**	65	6·6	26·9	29·75	45·88	**1 : 3·82**	1 : 5·44
Lupin, Yellow (in flower ..	16·0	18·5	2·3	31·6	26·5	5·1	**13·7**	**1·1**	**19·6**	**19·4**	69	8·5	33·8	30·63	55·27	**1 : 3·03**	1 : 4·88
Soya-bean hay	16·0	17·2	2·2	28·9	29·5	6·2	**11·9**	**0·7**	**19·1**	**15·6**	66	8·5	27·0	29·21	49·27	**1 : 3·05**	1 : 4·27

From the results of all investigations recorded up to and including Kellner's time it was concluded that maintenance of life and the production of wool alone are assured if sheep of the larger breeds are given a ration possessing an albuminoid ratio of 1 : 8·3, but the smaller breeds must have a slightly narrower ration, 1 : 7·5.

For maintaining the bodily requirements as well as for efficient milk-production cows in milk require on the average food possessing a ratio between the digestible protein and the digestible carbohydrates (albuminoid ratio) of 1 : 7. For pregnant cows a slightly narrower ration is necessary, the digestible protein being slightly increased. For dry cows a ration with an albuminoid ratio of 1 : 8 is required on the average. Unfortunately, states Kellner, under the usual conditions of pasturing there is a waste of food material, in that much more protein substance is consumed than is necessary, even when green fodder is needed—as, for instance, when stock are given as much young clover as they can eat. When, therefore, cows are on good pastures or when they are getting young clover they should also be given some straw; on the contrary, when the grass is poor some concentrated food is necessary. The quantity of straw which is to be given with the clover will vary according to the age of the latter, for the older the clover-plant becomes the less straw will be required, owing to the changes in the nutrients of the plant.

Apart from the various calculated ratios shown in the tables indicating the relative nutritive values of the various grasses and forage plants, in the light of the above-mentioned findings of Kellner they each show approximately to what extent they approach the balanced ration or the approximate degree of protein-content prescribed for the various classes of animals mentioned. Possessed of such knowledge the farmer or grazier can select certain grasses and clovers, or mixtures thereof, thereby forming a pasture whose approximate nutritive value he knows, and hence its adaptability for pasturing certain classes of stock. In like manner he is very largely able to increase or decrease the nutritive value, widen or narrow the ratio, according to his requirements—the class of animals he is feeding—thereby tending to balance a ration under natural conditions. To illustrate, lucerne possesses a narrow ratio, while prairie-grass has a fairly wide ratio. A mixture of these two practically furnishes a balanced ration, as does 1 part by weight of lucerne to 2 parts by weight of matured maize. Of course, there are other factors governing the effective feeding of animals, as, for instance, the palatability of the food and the individuality of the animal being fed; but as digestive nutrient-content is the most important, the above-mentioned numbers and ratios should be of value to farmers desirous of feeding their stock under the most economical conditions and therefore to the best advantage.

COMPARATIVE PALATABILITY OF FORAGE CROPS.

PRIMROSE McCONNELL.

IT is perhaps not sufficiently recognized that the palatability of a forage crop should have considerable weight when a farmer is deciding on the crop to grow for forage purposes. When farm stock are turned on to a feed they dislike they make no progress for some time, as most of their time is spent in wandering round in search for something that is more to their taste; and every practical farmer knows that nothing is more conducive to a thriving condition among live-stock than an environment which gives rise to contentment. If sheep or cattle spend a considerable part of the day in resting and placidly chewing the cud, the owner may rest assured that his stock are satisfied with their surroundings and are making the best use of the food supplied them.

At Ruakura, during the past month, an experiment bearing on the above was carried out. A 6-acre field which is entirely devoted to cereal-selection work, and contains a number of varieties of wheat, oats, barley, rye, and emmer, also 800 single-head selections, was fed off with sheep when the cereal plants were about 6 in. in height. During the experiment Mr. Green, the plant-breeding officer of the station, made the following notes:—

"Varieties that made rank vigorous growth were not in all cases left to the last, particularly with barleys. Black Skinless, Garfield, Mandscheuri, and Invincible, all of rank growth, are apparently more palatable than Gisborne, Chevalier, Goldthorpe, and Maltster. Archer's Chevalier is eaten much closer than ordinary Chevalier, while ordinary ryecorn is preferred to Emerald, and red emmer is preferred to white emmer. Out of three new barleys, Princess, Original Hanna, and Neil's Franken, the Princess variety was chosen first.

"A noticeable point is the preference the sheep have for all the Macaroni wheats over the ordinary varieties. Candeal, Durum, and Wild Goose Spring, which belong to the former, were eaten close; while Bobs and Thew, which belong to the latter, were scarcely touched. Rieti wheat selection plots show very little difference in palatability, but Cape barley selection plots varied considerably. Almost every selection of solid-straw Tuscan wheat was left uneaten. The following list shows what varieties were eaten down and what were avoided:—

"*Varieties eaten down.*—Barleys: Russian, Mandscheuri, O.A.C., Best Italian, Six-rowed, Black Skinless, Garfield, Invincible, Archer, Swan-neck. Wheats: Red Fife, White Fife, Canadian Spring,

Rieti, Burgoyne, Huguenot, Ble Pentanielle Noire de Nice, Ble de Miracle, Durum, Candeal, Wild Goose Spring.

"*Varieties left uneaten.*—Barleys: Goldthorpe, Maltster, Salcote Two-rowed Winter, Original Hanna, Neil's Franken, Gisborne. Wheats: Bobs, Thew.

"In the case of oats every variety was eaten down hard, the sheep preferring them to barleys, wheats, or ryecorns."

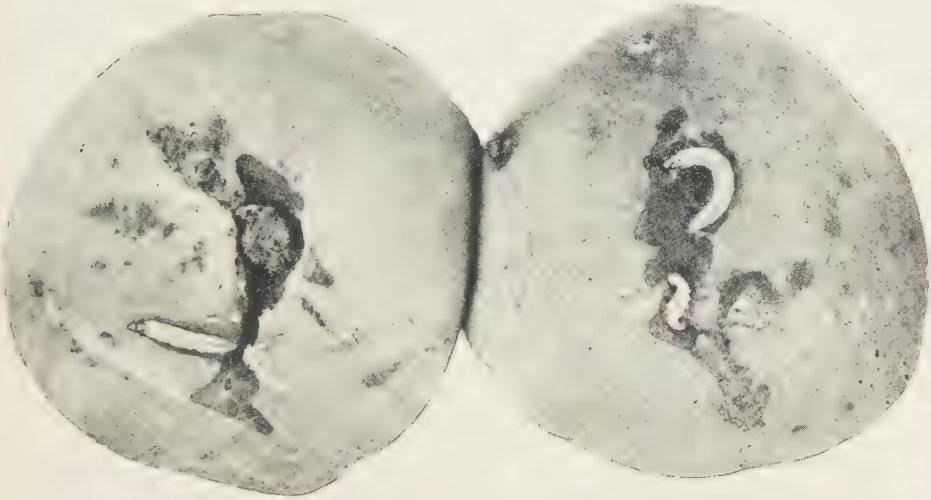
LEAF-ROLLER CATERPILLAR.

George Stratford.

During the past season a considerable amount of damage has been done in orchards all over the Dominion by the leaf-roller caterpillar. This pest, although not new by any means, appears to have been greatly on the increase, and the loss due to its ravages has been keenly felt by many orchardists. The fruit-tree leaf-roller is probably well known to all growers, being a light-green larva, very active, with an almost black head, measuring about three-quarters of an inch when fully grown. The larvæ begin to hatch out with the opening of the buds of the apple-trees in the spring, and at once begin to attack the tenderest leaves towards the tops of the trees, folding the leaves about themselves for protection. When abundant, the caterpillars may completely defoliate a tree. In these folds the larvæ live, feeding on the leaves. They finally change into light-brown or rust-coloured moths, which are easily distinguished, the lower wings being slightly lighter in colour than the top wings. There are several broods during the season, the larvæ being in the chrysalis stage only a very short time; in fact, larvæ can be found feeding on the rolled-up leaves of a great many plants, both cultivated and native, throughout the year, thus showing the necessity for systematic and frequent spraying of infested orchards—not only the fruit-trees, but hedges.

The moth is slightly larger than the codlin-moth, and has a more or less sharply pointed head. The eggs of the leaf-roller may be found in little grey patches anywhere upon the bark of the trunk or limbs of the trees. Not only does the leaf-roller caterpillar damage the foliage, but it attacks the fruit, making it unmarketable. During the past fruit season hundreds of cases of apples, perfect in every other way, could not be exported from the Nelson district owing to the ravages of the caterpillar. It works at the calyx end of the apple, eating off the skin, and then burrowing into the apple straight to the core, or very frequently contenting itself with pitting the fruit. Being so very small, and

working down in the calyx, it is almost impossible to detect; in fact, the most careful packer would have to use a magnifying-glass to see the tiny hole into which the grub has entered. Not only that, but an egg may be deposited in the calyx end of the apple and hatch out after the fruit has been packed ready for shipment. While inspecting fruit for shipment to South America early in the season I opened several cases of Jonathans which had been packed for two weeks. I saw these apples packed, and they appeared to be absolutely free from any trace of the leaf-roller caterpillar. When looking through the cases I found several of the caterpillars, besides much evidence of the damage they had done; and in one case a perfect moth was found in the wrapping-



Leaf-roller Caterpillar on New Zealand Peaches at San Francisco.
Photograph taken by the State Authorities of California, and forwarded by Mr. E. Clifton.

paper, with the empty cocoon-case at the calyx end of the apple. Caterpillars placed in a box in the office changed into perfect moths in eight or nine days.

Leaf-roller is very hard to control when once it is firmly established in an orchard, owing to its rolling the leaves over itself, making it almost impossible for spray to penetrate in to the insect; and it is only by persistency in spraying that we can hope to eradicate what might prove to be one of our most serious orchard pests. No doubt the best remedy is to spray thoroughly with arsenate of lead as soon as the first leaves are out, following on with other applications in the course of a week or ten days. Another summer spray that appears to have done exceptionally good work where used is lime-sulphur $\frac{1}{2}$ gallon, tobacco $\frac{1}{3}$ gallon, water 60 gallons. Although this spray is chiefly used to combat red spider, it is very effective on the leaf-roller caterpillar.

MARKETING FRUIT.

T. C. Webb, Jun.

Owing to the quantity of local fruit being condemned in city markets, a few hints to the grower are apparently essential if he is to realize the mistake of neglecting that all-important phase of his business, the packing and marketing of fruit to the best advantage. Growers have been repeatedly advised as to the methods of packing, grading, and branding of cases, and of placing the fruit in an attractive way before the buyer, but some growers are slow to improve their methods, and are therefore rapidly losing favour with the public.

Interest is now being awakened in the exportation of fruit, and it may be well to confine my remarks to those classes of fruit suitable for the export trade, apples and pears, for the essentials in preparing fruit for oversea markets apply with almost equal force to local trade requirements. Firstly, take the case in which the fruit is packed. The majority of growers evidently make their cases months before the fruit is ripe. These are stacked up in the orchard and are left to become breeding-centres for moths and grubs. In fruit-inspection work the sides of the cases are removed. It is not infrequently found that under the edge of the boards there are cocoons of the codlin-moth, with the grub inside—a prolific means of spreading this pest. Then, the partially weather-beaten case is never so attractive a package for choice fresh fruit as it undoubtedly should be. But undoubtedly the bugbear of the fruit trade is dishonest packing: that is, the best samples of fruit are packed on the top and bottom of the case, while the centre is filled with rubbish, which is too often diseased. In this case the lines must be destroyed. In lines that are not infected with disease but are filled with rubbish the buyer makes a note of the particular brand, and thereafter avoids it.

Construction of the Case.

Very few give this matter any particular attention, and yet it is one of great importance. The damage occasioned by badly made cases is enormous. I have noticed many of the larger growers, men who pack thoroughly, are often heavy losers through too large a space having been left between the two side boards of the case. This wide opening causes the fruit to become bruised, and even cut open, by reason of the jarring and bumping it goes through during its transit from orchard to market. The

fruit naturally bleeds a good deal, and thereby gives the case the appearance of containing squashed and rotten fruit. As a natural result a lower price has to be accepted. In making a bushel case, the two side boards should not have a space of more than a quarter of an inch between them. This will be found quite sufficient for ventilation. The nailing of the case in some instances is done in a slovenly manner. I have counted eight nails in the end of each board at the top, while in the two bottom boards there were only four at each end. It must be remembered that one or two cases of each line marketed have to be opened for inspection by the Department's official, and also for examination by buyers on the markets. The appearance of the fruit after five minutes of endeavour to open the lid of a badly or excessively nailed case can be better imagined than described. Three nails in each end should be sufficient.

Branding of the Case.

This is not given sufficient attention. Consignments containing various varieties and grades are sometimes shipped under the one mark, such as T E over W, and no other mark appears on the case to indicate its contents. During the inspection of these it may so happen that the official may get two cases of one variety affected with scale, and the whole line is thereupon condemned. Half of the line consists perhaps of another variety, free from scale, but as no indication of this fact appears on the case the whole line runs the risk of condemnation. Again, the auctioneer has to open every case in order to put the different varieties and grades together, and if a line of mixed varieties is met with the work of marketing is interfered with. On the other hand, if it can be shown that there is a definite number of cases of one grade and of one variety, much more competition is obtained. In other instances cases have been marked, say, "Cox's Orange," and have been found to be unreliable, suggesting that the marking was done after the fruit was packed and had been perhaps mixed with other varieties. For instance, a man may buy a line of Jonathans, and a few days later finds that he has several cases of cooking-apples amongst them. Now, he pays 10s. a case for the apples as being of dessert quality, but receives some worth only 4s. 6d. Naturally he demands a refund. This is a prolific cause of trouble in auction-rooms, and naturally makes the buyer fight shy of the unsatisfactorily packed line in future. On the other hand, it is just possible the buyer may chance to see the cookers first. He pays, say, 4s. 6d. a case for them, and then finds to his astonishment that he has dessert apples worth 10s. a case. As a rule he does not report the error, because he was "had" perhaps often enough before.

I maintain that a grower should have a fair idea of what number of cases for each variety he will require for the season, and mark each end of the cases, but without making them up. These could be stacked away in rows—say, one row of Sturmers, one of Cox's Orange, and so on. Then when one variety is being picked the cases branded for that variety could be made. The branding of the ends is, of course, a wet-day occupation. The case should be branded with the name of the grower or orchard, grade, quality, and variety.

Packing.

The Department has recently issued a bulletin on apple-packing. This gives all the information required. It is necessary that the apples should be graded and packed properly; in fact, were this made compulsory growers would find that there would be a standing price for desserts and for cookers. The Department has always advised the wrapping of high-grade apples, but this method must not be abused by wrapping up diseased fruit and so trying to hide its quality and condition from the retailer. Attempts at deception of this kind will always be dealt with in a severe manner. Wood-wool is essential to the safe carriage of fruit, but growers should bear in mind that it cannot be sold by space at the same price as apples; a pound of wood-wool may be made to occupy the space of many pounds of apples, and where a quarter of the case is filled with wool a big price for the apples cannot be expected. It is advisable to use it sparingly. When going through certain lines it appears to me that the fruit has been packed and stored away for some considerable time before being placed on the market. I would suggest that this fruit should be repacked, as there are often many apples bruised through rough handling, which soon rot and affect others, with the result that on arrival at the market they open up in a very bad state.

The Retailer.

It is no uncommon sight to see retailers in the auction-rooms waiting for a certain brand to be auctioned. Each buyer has his eye on the marks of good growers, and willingly pays the price demanded for honest clean fruit. The buyer in his capacity as a retailer has to supply a good article to the public, and he can therefore only afford to buy the best procurable.

Conclusion.

In conclusion it cannot be too strongly impressed upon the mind of the orchardist that the industry is just now in its initial stage. There are too many apples for local requirements and not enough to

fulfil the demands of our export trade. Whilst every advantage should be taken to capture the trade of oversea countries, it should not be overlooked that there is always an excellent market for a fairly large quantity of *good* fruit at remunerative prices in our own country. The importation of American apples into New Zealand could be greatly decreased by New Zealand growers placing large quantities of reserve fruit in cool storage. This is one of the factors in the industry that remains to be developed. Several lines of pears this season were marketed too late, and mostly opened up in bad order, bringing the disastrous price of 1s. a case. Had these been sent a week or two earlier the fruit would have arrived in a far better condition and would have brought at least 8s. a case.

ERADICATION OF WEEDS.

THE CALIFORNIAN THISTLE.

A. Hughes.

The weed most dreaded by farmers in this Dominion is no doubt the so-called Californian thistle (*Cnicus arvensis*). This thistle is known by four names—the Canadian, Californian, corn, and creeping thistle. The first two are local names, and the last-named the correct one, but as it is more generally known as the Californian thistle it will be better to continue calling it by that name. It is a native of Europe, Asia, and Africa, and, fortunately, is the only one of the true thistles that is a perennial.

I have frequently heard it argued that the Californian and the Canadian thistle are different, and that they bear different flowers, one of a lighter shade than the other, and that there is also a difference in the foliage. The explanation of this is that one is the male and the other the female plant. Then I am met again with "Oh, I had a patch of dark-flowered plants which I cut, but they still increased." No doubt they did, but from the roots and not from seed, and also by reason of the fact that they had only been cut once. To put it in a nutshell—the flower is diœcious —that is, those on one plant are male only, and those on another plant female only.

The best means of eradicating this weed that I have come across yet is a systematic cutting, and commencing this work early in the summer. The plants manufacture a large amount of food material in their leaves, and this is transferred and stored in the underground stems and buds, so that it becomes quite evident that to cut after this food storage has taken place has not the desired

exhausting effect. The weed must be cut not only early but be cut often. The cutting should be repeated as frequently as possible during the season. Perhaps after cutting the first time the plants will come up more numerous than before, but this will be from the underground stem, and in sending up these shoots the vitality of the plant has been weakened. If the stems and leaves, which are the breathing and assimilating organs of the plant, are destroyed as soon as they appear it stands to reason that exhaustion and death must result. The fault with too many farmers is that they think one cutting should kill the weeds, but this is not so except with annuals. Where the weeds are growing in a grass paddock the mower may be run over them several times without much trouble or expense. If ploughing be resorted to, the root must be collected and burned, and the land kept under root crops and be maintained in a clean condition as long as the weeds show up. Continual hoeing in arable land is an effective means of control, as it never allows the plants to come away.

Where the pest is found in the grain crop it should be attacked at once by hoeing early and late in spring, and pulling up by hand as long as it is possible to get amongst the corn. In the Old Country farm labourers—men, women, and children—are sent into the cornfields armed with spades and hoes, and with leather gloves on, to eradicate the corn thistle, and this is done several times during the spring and early summer.

The flowers of the plant develop, unfortunately, just before and during harvest, and, if they are allowed to mature, the distribution of seed is assured during the process of cutting and carting.

Several chemical methods of eradication have been suggested, such as sulphate of copper, carbolic acid, sulphuric acid, and arsenite of sodium, but up to the present I have not found any of these a success. The sodium arsenite is a poison and therefore dangerous, as is also sulphate of copper, if sufficient quantities are used. Carbolic acid will kill the stalks but will not penetrate to the roots. Agricultural salt (sodium chloride) when put on thickly has often proved effectual, but the salt must be used in large quantities and the stock be allowed to have access to it. Salt extracts the water from damp air and surrounding objects, and, when applied to succulent plant-tissue, it draws the water from this and produces an effect similar to drying or scorching.

The advice given by the British Board of Agriculture is as follows: "Faithful systematic cutting with the spade or scythe in meadows and pastures throughout two seasons, or the growth of a couple of root crops in succession where the weed is very prevalent in arable land, is a sure plan of getting rid of this most troublesome agricultural pest."

DAIRY-FARMING IN SWITZERLAND.

A TRIPLE-PURPOSE BREED OF CATTLE.

W. Wright.*

The Sixth International Dairy Congress, which I had the honour to attend as a representative of the Dominion of New Zealand was held at Berne, the capital of Switzerland, during the month of June of this year. The Congress was well attended, there being official delegates of twenty-six countries and States present, or 367 delegates in all. The principal sessions took place in the Exhibition grounds at Berne, the period of the Exhibition having been from May to September. The Congress meets triennially, and the next will take place at Copenhagen. In connection with this year's Congress excursions were arranged by the local committee of management for the benefit of foreign visitors. I took advantage of those which promised to furnish interesting information to the dairymen of the Dominion.

Rutti Agricultural College.

The first place visited was the Agricultural College at Rutti, situated in the vicinity of Berne. It is under the directorship of Mr. Alfred Fitkiger, who has as his assistants six permanent masters for theoretical training and four for the practical part of the work of instruction. This most useful institution was founded in 1860, on an estate belonging to the son of Emmanuel de Fellenberg, the founder of agricultural teaching, and has an area of 160 acres—98 acres arable, 21 acres forest, and the remainder alpine pasturage. The college now belongs to the Canton of Berne, and is also in receipt of a yearly subsidy from the Federal Government of 105,000 francs.†

There is accommodation provided for from seventy to eighty students, who take a two-years course in agriculture, practical and theoretical. The annual students' fees are 350 francs for the first year and 200 francs for the second year, which includes lodging, board, and washing, the students doing all the work of the farms The number of students who take the winter course of four and a half months during two consecutive winters is between 130 and 140, the fee for this course being 170 francs, including board and

* New Zealand Dairy-produce Inspector, London. † Franc = 10d.

lodging. The candidates for admission must be between sixteen and seventeen years of age, and must have received a sufficient preparatory education in theory as well as in practice. During the winter months theoretical work is taken up by the students, and lectures are arranged for their benefit. About one month's holiday is granted to students each year. Arrangements can be made by which a student can take a four-and-a-half-months winter course at the college.

The stock on the farm consists of 100 to 110 head of cattle, all of which are of the Simental breed, eight to ten horses, and a number of breeding-sows and boars. The milk-yield of the cows

A Four-year-old Bull of the Simental Breed.

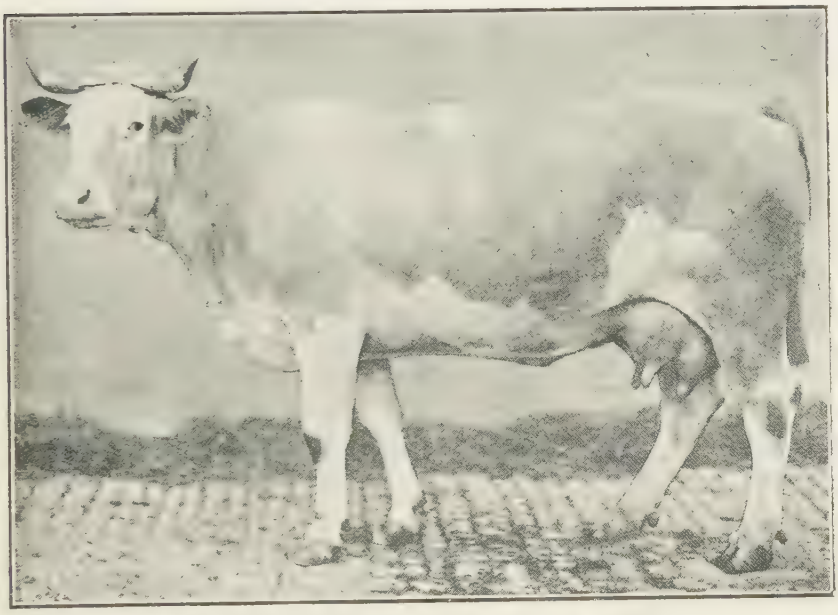
ranges between 3,000 and 4,500 litres* with an average for the herd of 4,100 litres of milk, containing an average fat-content of 3·75. The milk obtained from the dairy herd of from sixty to sixty-five cows is sold to the Dairy School for cheese-making purposes after the lacteal needs of the farm students have been supplied.

The Simental cattle, as will be seen by the photographs, are large-framed and heavy in weight, and are, in Switzerland, described as "a triple-purpose breed"—*i.e.*, milk, beef, and draught. The bull at the head of the dairy herd at Rutti cost 6,000 francs (£250) as a yearling, and a younger bull in the same stable cost nearly 4,000 francs (£170). The value of the cows at from three to four years is approximately £33 each on an average.

* Litre = 0·22 gallon.

The cattle at the college are stalled practically all the year round, all feed being taken to the stable to feed the animals, the rations being hay, oil-cake, and rye in winter, to which beet or mangels and cooked potatoes are also added. Milking is done twice daily, and the opinion is held that a cow attains her greatest milking-value after her second calf.

The breeding of pigs for bacon purposes received great attention here, as, in fact, it did in all instances that came under my notice where dairying is carried on in this country. The pigs are of the large white Yorkshire breed. With the exception of occa-



A Cow of the Simental Breed.

sionally introducing new blood in the male line for breeding purposes, all the pigs are reared at the college. Whey and crushed corn is used in pig-feeding, and the baconers are sold alive. At the time of my visit the stock consisted of about 110 head all told, and, with the exception of the necessary breeding-sows and males, these were being turned into bacon in the several pens in the pig-house, and were in various stages of age and condition. It was very noticeable that no bedding-material, such as straw, was used in the piggeries, the animals lying upon a bare floor of hollow bricks. The buildings are all heated by steam during cold weather.

Another important part of the work of the college is the conservation of all farmyard manure. Large underground tanks are in use, into which all the manure of the stables is conveyed, both

liquid and solid being run into the same tanks. During the period of my visit the frequency with which one met manure-carts and saw the manner in which the manure was distributed systematically on the pasture land gave one a very good insight as to the reason for this country's agricultural prosperity. I am so much impressed by the methods that I have seen here, and so convinced of the value of such methods of distributing valuable plant-food to pastures, that I strongly recommend it to the serious attention of the farmers of the Dominion. I believe that if this manure-tank system were in general use in the Dominion, particularly in those parts in which the work of dairying is carried on, it would prove a very valuable asset indeed to those farmers who decided to adopt this method of supplying manure to pasture land.

The storage accommodation for liquid manure at the college suffices for about three weeks, but the manure is applied as circumstances permit, a particularly favourable time being after a rainfall or during showery weather. The practice here is to add about 3 per cent. of superphosphate to the manure immediately before it is run off into the manure-carts. There is a feature of some importance relative to the adoption of this system in the Dominion, and that is the great aid that it would be toward keeping the dairy premises in a much more sanitary condition, owing to the fact that the manure being run into tanks would mean a lessening in a marked degree of the soil-pollution that is at the present time going on in the vicinity of the milking-sheds of the Dominion. It might be argued that, as the dairymen of the Dominion do not stable their cattle, as is the case with Swiss dairymen, the system could not be applied in New Zealand; but, making allowances for different conditions prevailing, I beg leave to commend the system to the notice of those interested. Wagons are built especially for the distribution of manure of liquid form in Switzerland, the most up-to-date type having an appliance for raising the fore end of the vehicle as the quantity of the material in its body decreases. There is also an attachment to the outlet tap which causes the fluid to be spread out fan-shape before reaching the ground.

Instruction is also given at this institution in the manufacture of cider. The use of cider is growing in favour in Switzerland, and there are now several factories in the country in which that beverage is manufactured. Apples and pears are used in its manufacture, the planting of fruit-trees being encouraged especially in districts where the pasture land is of rather poor quality, with the idea of assisting the farmer to get a larger return from his land. It is quite a common sight to see large areas of pasture land dotted over with large apple, pear, and other fruit trees.

There is no elaboration of detail in the construction of the buildings on the farm, they being all constructed of wood, and are of the usual farm type of the country.

Leaving the college, a short walk of about a quarter of an hour brings one to the Dairy Technical School, which is situated on the same estate, and is especially adapted for the training of factory managers and assistants required for the numerous cheese-factories and dairies of Switzerland. This school was established in 1887, and is under the direction of Mr. Peter. The instructional staff consists of three lecturers or masters in theoretical work, and for the practical work of the cheese-factory there is a manager, who has also three assistants under him. Accommodation is provided for about forty pupils, the maximum being generally reached during the winter months. The buildings of the school comprise cheese-factory, piggery, laboratory, dormitories, library, lecture-rooms, and other buildings incidental to such an establishment. The course of lectures lasts from twelve to eighteen months. Students taking a six-months course must have had two years' experience in a cheese-factory, and those taking a one-year course must have had at least one year's experience in a cheese-factory before being admitted to the school. The fees are at the rate of 400 francs per annum, but poor students are, I understand, sometimes granted financial assistance. The students carry on the work of the school, being instructed in cheese-making, pig-raising — in fact, in all branches of dairy-work. Chemistry and bacteriology are also taught, there being well-equipped laboratories fitted up for the purpose. Series of lectures are given in comfortable lecture-rooms, and the manufacture of cheese goes on all the year round. At the present time it is not obligatory for cheese-factory managers to have a dairy-school certificate of proficiency, but it is distinctly to one's advantage to have one. It is not an uncommon occurrence for students from the Agricultural College to come into the Dairy School to take a year's course at the institution. The milk-supply for the cheese-factory is obtained from the dairy herd of the Agricultural College and from the neighbouring farmers, and 18 c. per kilo is paid for it. An arrangement is also in vogue by which 1,500,000 kilos of milk are delivered yearly by two dairy companies at a prefixed price. The milk is bought by weight, irrespective of butter-fat content, the daily milk-supply being 4,000 kilos. Emmental and some soft varieties of cheese are made on the factory premises connected with the Dairy School, and also some butter. In the manufacture of Emmental cheese the best results are obtained from milk with a fat-content of about 3·4 per cent. As the average fat-content of the Simental cows in the district is 3·75 per cent., a portion of the milk-supply is hand-skimmed, it

being the custom to keep back a portion of each day's milk-supply, which is set in pans, then skimmed and added to the fresh milk supplied the following morning. It is recognized as a fact that a high fat-content prevents the formation of gas-holes in the cheese, and this is not at all desirable in the manufacture of Emmental cheese. The reason advanced as to why the milk is not purchased on the butter-fat basis is because all the farmers have the same breed of cattle and feed the same class of feed to their cows.

Attached to the Dairy School is a large piggery, where, on an average, 300 pigs are kept daily for the purpose of being turned into bacon. The general practice is to buy the pigs when they are about three months old, when the price is generally about 40 francs (about 33s.) per head, and sell the animals at about eleven months old. The daily ration for the pigs is about 12 lb. whey, 1 lb. each of barley or rye and maizemeal. The work of the Dairy School being carried out on a commercial basis, the dairy factory is credited with 1 c. per kilo (or about 4½d. per gallon) for the whey supplied to the piggery. The aim of the staff is to turn the pigs out fat at eleven months from 250 lb. to 300 lb. live weight. As a result of last season's operations the pig department had a clear profit of 13,000 francs, or a little over £543, to its credit. All the whey is skimmed and pasteurized to 85° C. before feeding to the pigs.

The Triple-purpose Breed of Cattle.

The Simental breed of cattle, according to a brochure published by the Swiss Unions of Cattle-breeders, seems to have come down from a breed introduced into Switzerland by the Burgundians, coming from the north, and who emigrated about the fifth century. Since several generations the breeds of Schwyz, of Simental, and of Fribourg are kept very pure.

The colour of the cattle of the Simental breed is red mixed with white. The tints of these red spots go from yellow to a dark red (cherry red). The head, the lower part of the feet, the belly, and the udder are generally white, but you sometimes meet with animals with spots on these parts of the body. Quite white cattle or with a few spots are not generally liked.

The horns, the muzzle, and the hoofs are of a light colour, and go in general from a yellowish-white to straw-colour. The animals with dark spots have sometimes the tips of their horns of a reddish colour, the hoofs streaked, and dark spots on the muzzle, which is not considered as an indication of impurity in the breed. Generally these red and white spots are well and neatly defined. It happens sometimes that they blend together by means of a streak of about 2 or 3 centimetres formed by the white and yellow hair. Spots of

a mulberry-colour, or black ones, on any part of the animal's body are sure indications of the impurity of the breed, and must be ascribed to the crossing with other breeds. When such spots exist they are chiefly found in the ears, the mouth (the lower lip), the horns, the throat, the limbs, especially on the hoofs and the brush of the tail.

In the cattle of the Simental the form of the body and the characteristic signs are all a faithful expression of a breed created with combined aims in view. The whole has an aspect of great strength, without being coarse or brutal, as these types of the mountains were before being refined.

An Alpine Dairy Farm.

The head is of an average size (often small) and dry; the forehead, the jaws, and the mouth are well developed; the throat is of an average length, strong and well attached to the head and shoulders. The chest is long, broad, and deep; the sides are normally developed; the shoulders are broad and well attached to the withers and chest; the back is strong and broad; the croup long and broad and well muscled. Sometimes you see animals with a high croup and the tail placed too high. This defect was frequently found many years ago, but has been eliminated, little by little, by rational rearing. The limbs are strong without being coarse, with good muscles; broad and dry in the articulations; the thighs broad and dry; the hoofs well rounded and closed. The hide is of an average thickness, at the same time elastic and mobile. The escutcheon has a normal development. The hind legs are well fixed and sometimes turned a little outwards.

The animals with a broad, low trunk and with limbs of an average length, strong, with good muscles, are those which answer best to that type of animal destined for several ends. The animals with high legs, narrow and badly developed trunk, are generally not very apt at work.

The females designed for rearing receive milk for the first five or six months. It is given to them little by little, arriving at a quantity of 8 to 9 litres a day, which quantity they receive during the space of five to eight weeks, and which is slowly diminished from the tenth or twelfth week till they are completely weaned. They are accustomed early to being fed on dry pasturage, and from the seventh or tenth week are given oats, bruised wheat, and bran. In the first summer they are kept in the farm, and in the two following years they go to the mountains.

During the summer months the cows are fed exclusively with green forage (lucerne); in autumn they go to the camp for about four or six weeks, and in winter are given dry forage, together with from 5 to 7 kilos of beet-roots and an average of 2 kilos of strong forage (that is to say, 1 kilo of sesame cake and 1 kilo of bruised corn and dried dregs) to each animal every day. Since the year 1897 the cows go to the camp in spring too for the space of two to three weeks.

The production of milk has been calculated by dividing the total production of the year by the totality of the days of maintenance and by multiplying the result by 365 or 366. The yield given by each cow is determined by means of tests made twice a month.

In 1903, the Union of the Association of Cattle-raisers of the Simental made verifications on a great scale concerning the yield of milk of this breed, many cattle-breeders and associations of cattle-breeders taking part. The results showed that the greatest annual production was 5,849 kilos, the fat percentage varying from 3·35 to 4·43. Cows of the breed, according to official figures, have given up to 6,078 kilos of 3·94 per cent. milk in the twelve months.

By reason of their build, constitution, and temperament cattle of the Simental breed are to a high degree apt for work, the greater part of the labour of the fields being done with animals of this breed, while they are also used for haulage-work on roads.

In the case of rational fattening the Simental breed gives very good results, as well in the quantity as in the quality of the meat. Proofs of this are provided at the markets of animals for slaughter. The flesh is said to be firm, with fine fibres and well provided with fat. The best results are obtained with the oxen, the heifers, and young cows; but even the milk-cows from eight to ten years of age give, in general, good results.

IMPORTATION OF FERTILIZERS.

B. C. Aston.

In presenting the figures for the year's importation of fertilizers, compiled from the quarterly returns supplied by H.M. Customs, attention must be drawn to the further fall in the amount of bonedust imported Thus the figures which in 1911 stood at 11,058 tons, in 1912 at 10,709 tons, and in 1913 at 9,281 tons. were this year only 6,578 tons. This I consider is a subject for congratulation, as it is extremely problematical whether bonedust is worth £7 to £8 per ton to the farmer. One would like to see some really convincing experiments carried out to prove the real value of this high-priced fertilizer. On the other hand, the cheaper phosphates, basic slag and superphosphate, each show an increase of approximately 10,000 tons over the previous year's imports. The popularity of basic slag is well sustained, as is shown by the figures for the last six years: Year ending 31st March, 1909, 4,321 tons; 1910, 5,013 tons; 1911, 8,670 tons; 1912, 16,107 tons; 1913, 20,133 tons; 1914, 30,350 tons. What will happen this year, now that the German source of supply is cut off, remains to be seen. Can we produce an efficient substitute in New Zealand?

In the following particulars of the importation of fertilizers into New Zealand the port of entry, name and quantity of fertilizer, and country whence imported, respectively, are shown:—

AUCKLAND.

Bonedust.—Victoria, 5 tons; New South Wales, 2,543 tons; Australia n.o.s., 1,381 tons; Bengal, 1,628 tons.
Bone Char.—New South Wales, 665 tons.
Blood Manure.—New South Wales, 211 tons; Australia n.o.s., 50 tons.
Blood and Bone Manure.—New South Wales, 322 tons; Australia n.o.s., 448 tons.
Basic Slag.—United Kingdom, 7,333 tons; Germany, 3,319 tons; Belgium, 7,958 tons
Guano and Rock Phosphate.—Victoria, 566 tons; Australia n.o.s., 10 tons; Malden Island, 1,190 tons; Christmas Island, 7,057 tons; New Caledonia, 520 tons; Seychelles Islands, 2,546 tons.
Superphosphate.—United Kingdom, 7,325 tons; New South Wales, 2,602 tons; Belgium, 1,557 tons; Germany, 3,245 tons; Holland, 1,525 tons; Japan, 305 tons; U.S.A., 25 tons.
Phosphate n.o.e.—Belgium, 149 tons; Germany, 25 tons.
Sulphate of Potash.—United Kingdom, 39 tons; Germany, 500 tons; Belgium, 35 tons; New South Wales, 19 tons.
Muriate of Potash.—Germany, 20 tons.
Kainit.—United Kingdom, 192 tons; Germany, 995 tons; Belgium, 25 tons; Austria, 10 tons.
Potash Manure.—Germany, 20 tons.
Gypsum.—South Australia, 370 tons; Australia n.o.s., 465 tons.
Sulphate of Ammonia.—United Kingdom, 11 tons; New South Wales, 36 tons; Australia n.o.s., 30 tons; Belgium, 60 tons; Germany, 7 tons.

NOTE.—N.o.e.= not otherwise enumerated; Australia, n.o.s= State not specified.

Nitrate of Soda.—United Kingdom, 10 tons; New South Wales, 195 tons; Germany, 2 tons.
Nitrolim (*Calcium Cyanamide*).—Norway, 25 tons; Sweden, 35 tons.
Nitrate of Lime.—Norway, 5 tons.
Sulphate of Iron.—United Kingdom, 40 tons.
Turnip-manure.—United Kingdom, 200 tons.
Rape-manure.—United Kingdom, 20 tons.
Clover-manure.—U.S.A., 1 ton.
Fertilizer n.o.e.—United Kingdom, 10 tons; Australia n.o.s., 20 tons.

Poverty Bay.

Superphosphate.—Victoria, 45 tons.

New Plymouth.

Bonedust.—New South Wales, 350 tons; Bengal, 35 tons.
Basic Slag.—Australia n.o.s., 70 tons.
Superphosphate.—Victoria, 1,075 tons; New South Wales, 25 tons; Australia n.o.s., 60 tons.
Guano.—Australia n.o.s., 18 tons.
Sulphate of Potash.—United Kingdom, 25 tons; Germany, 30 tons.
Kainit.—United Kingdom, 50 tons.
Gypsum.—New South Wales, 24 tons; Australia n.o.s., 160 tons.
Sulphate of Ammonia.—Australia n.o.s., 5 tons.

Patea.

Gypsum.—Victoria, 50 tons; South Australia, 50 tons.

Wanganui.

Basic Slag.—United Kingdom, 1 ton; Holland, 12 tons.
Superphosphate.—United Kingdom, 63 tons.
Gypsum.—South Australia, 10 tons.
Sulphate of Ammonia.—Australia n.o.s., 5 tons.

Wellington.

Bonedust.—New South Wales, 25 tons.
Basic Slag.—United Kingdom, 6,929 tons; Belgium, 808 tons; Germany, 671 tons; Holland, 50 tons.
Superphosphate.—United Kingdom, 1,348 tons; Victoria, 2,121 tons; New South Wales, 320 tons; Australia n.o.s., 297 tons; Germany, 545 tons; Belgium, 162 tons; Holland, 100 tons; U.S.A., 25 tons.
Guano.—Victoria, 50 tons; New South Wales, 60 tons; South Australia, 76 tons; Australia n.o.s., 24 tons; United Kingdom, 50 tons.
Bernard's Phosphate.—United Kingdom, 25 tons.
Phosphate n.o.e.—United Kingdom, 26 tons; Belgium, 50 tons; U.S.A., 10 tons.
Sulphate of Potash.—United Kingdom, 33 tons; Germany, 124 tons; Austria, 6 tons.
Kainit.—United Kingdom, 57 tons; Germany, 370 tons.
Potash Manure.—United Kingdom, 1 ton; Australia n.o.s., 150 tons.
Gypsum.—New South Wales, 3 tons; South Australia, 115 tons; Victoria, 48 tons; Australia n.o.s., 435 tons; United Kingdom, 1 ton.
Sulphate of Ammonia.—Victoria, 1 ton; Queensland, 10 tons; Australia n.o.s., 7 tons.
Nitrate of Soda.—New South Wales, 11 tons.
Nitrolim.—Australia, 10 tons; Norway, 15 tons; Denmark, 5 tons.
Nitrate of Lime.—United Kingdom, 5 tons.
Turnip-manure.—United Kingdom, 388 tons.
Sweet-pea Manure.—United Kingdom, 51 tons.
Fertilizer n.o.e.—United Kingdom, 51 tons.

Napier.

Basic Slag.—United Kingdom, 410 tons; Belgium, 132 tons; Germany, 25 tons.
Superphosphate.—United Kingdom, 400 tons; Victoria, 607 tons; Belgium, 160 tons; Japan, 900 tons.
Guano.—Victoria, 40 tons; New South Wales, 45 tons; Australia n.o.s., 20 tons.

Sulphate of Potash.—Germany, 10 tons.
Gypsum.—New South Wales, 22 tons; Australia n.o.s., 35 tons.
Nitrolim.—Norway, 5 tons.

WAIRAU AND PICTON.

Superphosphate.—United Kingdom, 35 tons.

NELSON.

Basic Slag.—United Kingdom, 343 tons; Germany, 237 tons; Belgium, 100 tons.
Superphosphate.—United Kingdom, 610 tons; Belgium, 23 tons; Germany, 25 tons.
Guano.—Victoria, 10 tons; Australia n.o.s., 5 tons.
Phosphate n.o.e.—Germany, 5 tons.
Sulphate of Potash.—Germany, 35 tons.
Kainit.—United Kingdom, 3 tons; Germany, 100 tons.
Gypsum.—Victoria, 9 tons; Australia n.o.s., 10 tons.
Sulphate of Ammonia.—United Kingdom, 10 tons; New South Wales, 5 tons.
Nitrate of Soda.—Belgium, 1 ton.

LYTTELTON.

Blood Manure.—Australia n.o.s., 50 tons.
Blood and Bone Manure.—New South Wales, 125 tons.
Basic Slag.—United Kingdom, 830 tons; Germany, 100 tons.
Superphosphate.—United Kingdom, 1,070 tons; Victoria, 1,592 tons; New South Wales, 201 tons; Tasmania, 969 tons; Australia n.o.s., 723 tons; Holland, 150 tons; Japan, 1,818 tons; Germany, 50 tons; U.S.A., 100 tons.
Sulphate of Potash.—United Kingdom, 7 tons; Germany, 40 tons.
Kainit.—United Kingdom, 85 tons; Germany, 150 tons.
Potash Manure.—United Kingdom, 120 tons; Germany, 55 tons.
Gypsum.—Victoria, 19 tons; South Australia, 965 tons; Australia n.o.s., 691 tons.
Nitrate of Soda.—U.S.A., 10 tons.
Nitrate of Lime.—Sweden, 5 tons; Norway, 5 tons.
Fertilizer n.o.e.—United Kingdom, 60 tons; New South Wales, 50 tons.

TIMARU.

Bonedust.—Bengal, 157 tons.
Basic Slag.—United Kingdom, 237 tons.
Superphosphate.—United Kingdom, 1,300 tons; Victoria, 1,442 tons; New South Wales, 50 tons; Belgium, 5 tons; Japan, 1,134 tons.
Guano.—New South Wales, 70 tons.
Basic Phosphate.—United Kingdom, 100 tons.
Sulphate of Potash.—Germany, 23 tons.
Kainit.—Germany, 10 tons.
Potash Manure.—Germany, 100 tons.
Gypsum.—Australia n.o.s., 600 tons.

OAMARU.

Basic Slag.—United Kingdom, 25 tons.

DUNEDIN.

Bonedust.—New South Wales, 79 tons; Bengal, 35 tons.
Blood and Bone Manure.—Australia n.o.s., 50 tons.
Basic Slag.—United Kingdom, 25 tons; Belgium, 50 tons; Germany, 50 tons.
Superphosphate.—United Kingdom, 100 tons; Victoria, 465 tons; Australia n.o.s., 30 tons.
Guano.—United Kingdom, 15 tons; Christmas Island, 1,069 tons; New Caledonia, 1,538 tons.
Sulphate of Potash.—United Kingdom, 80 tons; Germany, 80 tons.
Muriate of Potash.—Germany, 5 tons.
Kainit.—Germany, 25 tons.
Potash Manure.—Belgium, 10 tons; Germany, 80 tons.
Gypsum.—Victoria, 24 tons.
Sulphate of Ammonia.—United Kingdom, 40 tons; New South Wales, 5 tons; Victoria, 5 tons.
Nitrate of Soda.—New South Wales, 5 tons; U.S.A., 90 tons.
Nitrolim.—Victoria, 10 tons; Sweden, 5 tons.

Sulphate of Iron.—United Kingdom, 1 ton.
Pototo-manure.—United Kingdom, 62 tons.
Turnip-manure.—United Kingdom, 20 tons.
Rape-manure.—United Kingdom, 20 tons.
Fertilizer n.o.e.—United Kingdom, 1 ton.

INVERCARGILL.

Bonedust.—Australia n.o.s., 90 tons; Bengal, 250 tons.
Blood and Bone Manure.—New South Wales, 300 tons.
Basic Slag.—United Kingdom, 200 tons; Germany, 410 tons; Belgium, 25 tons.
Superphosphate.—United Kingdom, 500 tons; Victoria, 583 tons; Australia, 160 tons; Germany, 3,610 tons.
Guano.—Australia n.o.s., 40 tons; Christmas Island, 1,910 tons; Malden Island, 13,710 tons; Seychelles Islands, 1,454 tons.
Phosphate n.o.e.—United Kingdom, 150 tons.
Sulphate of Potash.—Germany, 2 tons.
Kainit.—Germany, 255 tons.
Potash Manure.—Germany, 570 tons.
Gypsum.—Victoria, 18 tons; New South Wales, 80 tons; South Australia, 170 tons.
Sulphate of Ammonia.—United Kingdom, 90 tons; Belgium, 140 tons.
Turnip-manure.—United Kingdom, 50 tons.
Grain-manure.—United Kingdom, 10 tons.
Nitrate of Soda.—Australia n.o.s., 4 tons.

SUMMARY.

The following is a summary of the kinds, quantities, and values of the various fertilizers imported into New Zealand during the year ended 31st March, 1914:—

	Weight.		Value.	
	Year. 1913–14. Tons.	Year. 1912–13. Tons.	Year. 1913–14. £	Year. 1912–13. £
Bonedust	6,578	9,281	41,870	60,050
Broken bones	..	133	..	766
Bone char	665	527	2,219	869
Blood manure	311	20	2,002	130
Bone phosphate	..	31	..	109
Blood and bone manure	1,245	1,735	8,212	10,344
Basic slag	30,350	20,133	97,589	66,389
Superphosphate	41,582	32,964	151,780	120,303
Guano and rock phosphate	22,093	25,033	56,169	65,084
Bernard's phosphate	25	502	84	1,598
Basic phosphate	100	..	350	..
Phosphate n.o.e.	415	393	1,409	1,459
Sulphate of potash	1,088	847	13,303	10,432
Muriate of potash	25	23	300	277
Nitrate of potash	..	20	..	241
Kainit	2,327	7,958	7,871	8,339
Potash manure	1,106	905	6,214	5,554
Phonolite	..	6	..	25
Gypsum	4,374	4,163	6,621	6,687
Sulphate of ammonia	467	439	7,090	6,962
Nitrate of soda	328	364	3,850	4,164
Nitrolim (calcium cyanamide)	110	146	1,168	1,560
Nitrate of lime	20	..	204	..
Sulphate of iron	41	25	167	122
Potato-manure	62	150	358	865
Turnip-manure	658	75	3,129	350
Rape-manure	40	75	192	360
Sweet-pea manure	1	..	22	..
Grain-manure	10	..	53	..
Clover, &c., manure	1	..	20	..
Fertilizer n.o.e.	192	..	1,154	..
	114,214		£413,400	

Importations for year ended 31st March, 1913: 100,601 tons = £374,257

THE COOL STORAGE OF CHEESE FROM THE LONDON VIEWPOINT.

W. WRIGHT.*

THIS subject is one that is worth serious attention on the part of dairy companies and others in the Dominion who manufacture cheese for export.

During the three years I have been carrying out my duties as Inspector of Dairy-produce I have had ample opportunity to observe the evil results brought about by submitting cheese to the influence of high temperatures in New Zealand before shipment. My sojourn in the United Kingdom has also enabled me to verify the results of observations made during my period of duty as a Dairy-produce Grader in the Dominion. While engaged in the work of grading I made note of, and reported upon, the considerable deterioration that takes place in the quality of the cheese that had been subjected to abnormal temperatures during transit between dairies and the grading-port, more particularly during the summer months. At that time I did not have the experience at my command that I have gained during the time I have been stationed in this country. As a result of my observations I am of the opinion that if New Zealand cheese is to reach Home or foreign markets in good order and condition it must have the benefit of cool curing-rooms at the factory, adequate protection from heat between factory and grading-port, and a period of cool storage before being placed on board ship. The heating of the cheese is responsible, at least in part, for many of the faults found in New Zealand cheese in this country to-day. These might be summed up as follows:—

(*a.*) Loose and open texture.
(*b.*) Exudation of butter-fat.
(*c.*) Greasy texture (through the cheese being cured at high temperatures).
(*d.*) Abnormal loss of weight.
(*e.*) Damage to the crowns of the cheese by adhesion to the centre-boards.
(*f.*) Development of a flavour peculiar to heated cheese.

The details aforementioned, it must be admitted, are common faults in New Zealand cheese, and, when found to exist in marked

* New Zealand Inspector of Dairy-produce, London.

degree, create a bad impression in the minds of buyers; so much so that sometimes this has the effect of turning a buyer right off the New Zealand article should Canadian cheese, for example, be available

It is a debatable point as to what extent high temperatures are responsible for the foregoing, but it must be admitted that unfavourable conditions, such as herein described, contribute very materially to rapid deterioration of quality in the finished article, irrespective as to what the quality of the raw material may have been at the time of its delivery to the factory for the purpose of cheesemaking. This being the case, it seems to me that it is absolutely essential to the future prosperity of the cheese-export trade of the Dominion that steps should be immediately taken by those interested to provide up-to-date cool curing-rooms, proper covered vehicles for cheese-transport between factory and rail or steamer, and to erect the necessary cool-storage accommodation at all shipping-ports to enable cheese to be cooled down before shipment. When such accommodation is available I would beg to recommend to your consideration the advisability that regulations should then be framed to make it compulsory for all cheese to be kept in cool store for a certain number of days before it can be placed on board Home or foreign steamers. My own idea is that the temperature of the cheese should be reduced sufficiently low as to correspond with the range of air-temperature fixed upon for the carrying of the cheese in the steamers' holds.

If such improvements as I suggest were brought into practical being I am strongly convinced that it would prove a most important factor in firmly establishing the reputation for quality of New Zealand cheese on these markets, with the result that buyers would then be much keener to do business in New Zealand cheese than is sometimes the case under existing conditions.

Whatever may be done in this matter, I beg to point out that there must be no weak link in the chain. To obtain the best results for money and labour expended it is most necessary that effective protection from heating must be afforded to the cheese between the time the cheese leaves the making-room of the factory until it reaches the particular market for which it may be intended.

Should cheese by any means become submitted to abnormal temperatures for a very short period of time—say, one or two days —no matter how great the care that has been expended upon it either before or after such an occurrence, the evil effects of such a period of heating will be noticeable in the cheese from that time until it goes into consumption. Once the structure of cheese

is damaged by excessive heating, no means can be brought to bear, that I know of, that will remedy the evil effects of such treatment.

[Several freezing-works companies have realized the importance of cool storage for cheese at ports of shipment. These companies are to be congratulated for their enterprise and desire to serve the industry in an up-to-date manner. For several seasons the Auckland Farmers' Freezing Company has provided the necessary cool-storage facilities for cheese, the Taranaki Producers' Refrigerating Company, New Plymouth, is cooling all cheese passing through its works this season, and the West Coast Refrigerating Company has made provision for the cool storage of a large proportion of the present season's output of the cheese-making companies shipping through the Port of Patea.—Ed.]

AMERICAN CREAMERIES:

HOW THEY UTILIZE THEIR BY-PRODUCTS.

E. Clifton.

It may interest your readers, especially those associated with the poultry industry, to be advised of the methods of fattening chickens in some parts of the United States. The writer visited a creamery where all the products were made the best use of. The buttermilk was used for the fattening of chickens. The building in which the fattening is carried on is of fair elevation, 100 ft. in length by 75 ft. wide. The manager estimated that its capacity is 10,000 chickens; in fact, he said that that number had been housed in the building. At the present time there are 7,000. These are in crates, each containing some ten to twelve chickens. The crates, of convenient height for the birds, are piled one above another to a height of about 6 ft., set up in ranges with just about room for the person carrying the feed to pass between. The ration consists of buttermilk, ground cornmeal, and pollard. In this establishment also large quantities of ice-cream is being prepared. With this small cones of biscuit-like material are used. In the manufacture of these there is a certain waste. All this, together with any other eatable material, is included in the rations for the chickens. The building is comparatively dark. The feeding is liberal, but, as the manager said, it is not extended to more than ten or twelve days, as the birds become liable to sicken. It is explained that the increase in weight in the ten or twelve days is about 30 per cent. When these birds are placed in the crates the weight

is taken and carefully recorded. The same process is repeated when they are sufficiently advanced for sale. This provides the data on which the profits of the undertaking are assessed. The chickens are purchased at from 6 to 8 cents a pound, live weight. The price fattened and delivered is averaged at from 20 to 22 cents a pound.

It is not suggested that poultry-farming should be entered into in New Zealand on such intense lines. This note is merely forwarded as possibly of some interest to your subscribers. It has been observed that the chicken-fattening establishment is in association with a creamery. This creamery is within the city limits. It receives from a very wide district consignments of home-separated cream. The creamery is very similar to those established in New Zealand in those parts of the country where home separation has been accepted. Here, as in our own country, the same difficulty is experienced in assuring the delivery of home-separated cream within a reasonable time of separation. Pasteurization is invariably resorted to. By means of this a very fair grade of butter is produced. This is set up in cartons containing from 1 lb. to 2 lb. of butter. A departure has been made in certain of the smaller packages. The pound is divided into quarters, and each of these in the carton is in its own wrapper. While the undivided carton of 1 lb. is sold at 35 cents, the separately wrapped quarters are sold to the consumer at 40 cents. In the words of the manufacturer, "The fool woman buys these quarters; it saves her some trouble." It is surprising the number who buy butter in this form. The two creameries I visited in the city are both maintained in good condition. There is an insuperable difficulty for factories established within the limits of the city, as the premises in which the various operations are carried out must of necessity be closely built—that is, the open conditions attending our factories built in the country are not possible here.

An interesting development in each of these factories is the preparation of ice-cream. It was explained that at one time it was difficult to secure the necessary quantity of fresh sweet cream during the period of warm weather. With the rising of the thermometer the consumption of ice-cream exhibits an inordinate volume. This is now provided for. Fresh sweet cream is received at any time and in any quantity. This is manufactured into butter that is permitted to remain unsalted. When the increased demand comes for the ice-cream this sweet butter is passed, with a proportion of fresh milk, through an emulsifier. The result is fresh cream. This is used for the preparation of the iced product so extensively consumed by the American people. This prepared

cream is passed into tin cylinders containing from 5 lb. to 10 lb. or more. If for consumption in the city it is delivered in this form. If it be required for transportation to any considerable distance the cylinders are packed with ice in a large wooden tub. With this precaution, it is claimed, the contents remain refrigerated for fully forty-eight hours. In these same factories hollow cones, something of the shape of a long wineglass, are manufactured of the biscuit-like material. A number of these cones accompany almost every consignment of the ice-cream. These contain just about 10 cents' worth. The cone and the contents are eaten. The vendors of ice-cream under these conditions are to be seen at any street-corner, and they apparently do a thriving trade. The manufacturers at Portland advised me that the volume of cream so prepared is estimated at 350,000 gallons per annum. The estimated weight is 5½ lb. per gallon. This, it must be realized, is a very important factor as affecting the manufacture of butter for consumption. The use of all refrigerated beverages and foods, such as ice-cream, forms an important part of the diet of the American. Our country has yet a long way to go before the consumption of these goods can approach that so general in this country.

AGRICULTURAL SHOW DATES.

Banks Peninsula A. and P. Association.—Little River, 24th November.

Auckland A. and P. Association.—Auckland, 26th to 28th November.

Helensville A. and P. Association.—Helensville, 29th January, 1915.

Dannevirke District A. and P. Association.—Dannevirke, 10th and 11th February; Ram Fair, 12th February.

Effect of severe October Frost.—The severe frost experienced in Canterbury on the 18th and 19th of last month did considerable damage to orchards in the Canterbury district, in the northern portions of which stone-fruit, pears, and potatoes were badly damaged, while in the more immediate neighbourhood of Christchurch plums and pears suffered more or less, some cherry-groves being turned quite black, the fruit withering and falling off, though in some cases the trees escaped with little damage.

Breeding-age in Holland.—The age at which bulls are put to service in Holland is one year to sixteen months.—*W. Wright*, New Zealand Inspector of Dairy-produce, London.

SEMI-OFFICIAL TESTING.

W. M. Singleton.

During the month of October our best records for the year have been completed. Previously our best yearly record belonged to a Holstein, Viola, owned by Mr. J. H. Parkinson, with 661·16 lb. fat. During October this has been thrice superseded—first by Holland Queen, owned by A. J. Gallichan, whose record placed the figures

New Zealand's Champion Cow: Mr. J. Donald's Holstein Heifer, Netherland Princess IV.

more than half-way through the next century. Holland Queen's record of 755·78 lb. fat lasted only one day, for on the 8th October the Jersey cow Madam Mayflower completed her record of 763·41 lb. fat. These figures stand as the maximum for mature cows in these breeds, and are certainly splendid productions. Their owners are to be congratulated on the magnificent performances which these cows have to their credit.

We are appending a detailed list of the season's performance of these two cows, so that readers may follow up the cows' records from their start, and through all their steps to their conclusion.

MADAM MAYFLOWER.

	Milk. lb.	Test.	Fat. lb.
1913—October (28 days) ..	1199·8	5·7	68·38
November	1442·3	5·7	82·21
December	1434·6	5·5	78·90
1914—January	1172·0	6·1	71·49
February	831·8	6·7	55·73
March	829·4	7·2	59·71
April	758·9	7·2	54·64
May	866·7	7·8	67·60
June	789·8	7·0	55·28
July	799·2	7·0	55·94
August	814·8	6·6	53·77
September	775·4	7·0	54·27
October (three days) ..	78·5	7·0	5·49

HOLLAND QUEEN.

	Milk. lb.	Test.	Fat. lb.
1013—September (nine days) ..	534·1	3·0	16·02
October	2550·3	3·0	76·50
November	2411·5	3·1	74·75
December	2371·3	3·3	78·25
1914—January	2157·5	3·3	71·19
February	1804·9	3·0	54·14
March	1723·8	4·0	68·95
April	1581·5	4·0	63·26
May	1544·5	3·9	60·23
June	1335·8	4·4	58·77
July	1234·3	4·5	55·54
August	940·9	5·6	52·69
September(twenty-one days)	439·5	5·8	25·49

A two-year-old Holstein, Netherland Princess IV, has also completed her yearly record by dropping a calf in October and subsequent to her season's testing. For some time we believed we had in this cow the world's record senior two-year-old on production. Her excellent record of 805·77 lb. fat in 365 days, with her subsequent calving on the twelfth day after her test concluded, has, we believe, no equal recorded. The best record we have knowledge of for a heifer in this class is 818·75 lb. fat. We have no knowledge of this American heifer's subsequent calving, and it is almost certain that she was empty for a much longer period during her test than was Netherland Princess IV, belonging to Mr. J. Donald, of Westmere. The monthly production of Mr. Donald's cow is as follows:—

	Milk. lb.	Test.	Fat. lb.
1913—October (twenty-three days)	1579·0	3·1	48·94
November	2355·5	4·1	96·57
December	2405·5	3·4	81·78
1914—January	2062·5	3·6	74·25
February	1889·5	3·7	69·91
March	1929·0	4·4	84·87
April	1639·0	4·4	72·11
May	1572·0	4·4	69·16
June	1394·5	5·0	69·72
July	931·1	4·8	44·69
August	862·8	5·3	45·72
September	830·3	4·8	39·85
October (eight days) ..	170·9	4·8	8·20

On the 8th July Netherland Princess IV gave 45 lb. milk. About this date she got into some green mangels, and her quantity fell right off until on the 14th July she gave only 7 lb. It took her some time to recover, and it is estimated that had this misfortune not occurred the world's highest record for a two-year-old heifer would be held in New Zealand by Mr. Donald's Netherland Princess IV. We believe she has even now a world's record when subsequent calving is considered.

Holsteins.

In the two-year-old class, Netherland Princess IV replaces Mr. Lovelock's Pietertje Lassie of Cliffside, which gave 597·28 lb. fat on first calving.

This month provides no change in the leaders of the three- and four-year-old classes. In the four-year-old class, Countess of Maplehurst (Reg. No. 543) is the third four-year-old Holstein to exceed the 500 lb. mark, and she ranks third in order in her class.

In mature Holsteins, Holland Queen replaces Viola. This is a long jump forward, and sets a high standard for next season's work.

Jerseys.

Until October, Mr. Hellyer's Lady of Collingwood had the best two-year-old record. She has held her honours longer than many, but is now beaten by A. A. Ward's Miro, with 548·69 lb. fat. In the three-year-old class, while the leader has not been displaced, she has close company in Bright Star II, belonging to Mr. S. R. Lancaster. Mr. Wilkinson's Pepper is leader with 546·01 lb. This is a nice performance.

Last month Mr. Griffiths's Ivy Riotress was leader of the four-year-old class, with 435·67 lb. fat. Since then Mr. Hall's Hazeline stands head of the class, with 449·09 lb. fat to her credit.

In mature Jerseys we publish our first 600 lb. records, and also our first 700 lb. record. The latter belongs to Madam Mayflower, owned by Mr. H. B. Curtis. This is very fine work, and will probably be our best mature Jersey record for our testing year. Other splendid records just completed are those of Mr. Edwardes's Sabean III, with 625·38 lb. fat, and Mr. H. E. B. Watson's Duchess of Lavington, with 600·16 lb. fat. All of these take precedence of the record of Mr. Dermer's Young Sybil, which was the best mature Jersey at the beginning of October.

Mr. T. S. Edwardes's Jersey Cow, Sabean III, New Zealand's Second Best Mature Jersey.

Mr. A. A. Ward's Jersey Heifer, Miro.

Ayrshires.

There are two changes in the Ayrshire classes this month, and some very good work is recorded. A large portion of some of these best records have been made on grass alone, and are therefore all the more creditable.

In the three-year-old class Kanadale Fanny, with 361·49 lb. fat, displaces White Blair, with 323·72 lb. fat. The mature class claims as leader Fancy IV, with 492·03 lb. fat. Kanadale Fanny is owned by Cockburn Bros., Mataura, and Fancy IV by Messrs. Watt Bros., Cambridge. Both of these breeders have been testing cows which have done them credit.

East Newton Beauty, belonging to Moumahaki State Farm, calved during the month, and just missed getting a certificate, on account of being some ten days late in doing so. Her record of 522·66 lb. fat last season is good for an Ayrshire heifer during her second lactation season.

It is unfortunate for this breed that there are not larger numbers of well-fed Ayrshires on test. There are some good strains in New Zealand which will stand more development and limelight.

Name of Cow.	Name and Address of Owner.	Age at starting Test.	Fat req'd. Cert.	Yield for Season.		
				Days.	Milk.	Fat.
Ayrshires.						
Two-year-old Class.		Y. dys.	lb.		lb.	lb.
Dandy of Clinton ..	Messrs. McPhail Bros., Clinton	2 334	273·9	307	9085·50	347·51
Three-year-old Class.						
Kanadale Fanny ..	Messrs. Cockburn Bros., Mataura	3 294	306·4	314	8918·80	361·49
Mature Class.						
Fancy IV of Cambridge	Messrs. Watt Bros., Cambridge	8 14	350·0	365	11686 50	492·03
Spray II of Cambridge	Messrs. Watt Bros., Cambridge	Yrs. 13–14	350·0	320	9560·40	413·27
Lady of Clinton ..	Messrs. McPhail Bros., Clinton	5–6	350·0	365	11194·50	402·37
Holsteins.						
Two-year-old Class.						
Netherland Princess IV	J. Donald, Westmere	2 341	274·6	365	19621·60	805·77
Laddie's Pearl ..	R. Gilmour, Mangatera	2 321	272·6	348	11489·30	348·33
Lady Buttercup ..	J. Pirie, Woodlands ..	2 34	243·9	343	8947·50	326·03
Segis II Belle ..	Newton King, New Plymouth	1 347	240·5	365	9367·30	316·12
Lydia Canary de Kol	C. C. Buckland, Cambridge	2 88	249·3	338	9270·70	309·91
Three-year-old Class.						
Colantha Pietertje Buttercup	W. Remnant, Palmerston North	3 272	304·2	356	14726·30	517·30
Dominion Jessie Fobes Beets	Weraroa Experimental Farm	3 152	292·2	365	15655·00	513·08
Monona Indi Surprise	A. J. Gallichan, Tiakitahuna	3 335	310·5	318	14022·00	404·91

Name of Cow.	Name and Address of Owner.	Age at starting Test.	Fat req'd. Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		HOLSTEINS—*continued.*				
Four-year-old Class.		Y. dys.	lb.		lb.	lb.
Countess of Maplehurst (Reg. No. 543)	C. A. Hopping, Glen Oroua	4 263	339·8	304	14414·30	502·09
Lillith Count Ingall's May II	J. H. Parkinson, Opotiki	4 154	328·9	329	10987·20	357·22
Five-year-old Class.						
Holland Queen ..	A. J. Gallichan, Tiakitahuna	5 52	350·0	365	20629·90	755·78
Lucy Witt of Ashlynn	C. A. Hopping, Glen Oroua	5 7	350·0	304	12750·30	462·93
Lady Mooie Blanco II	C. A. Hopping ..	9 194	350·0	241	10602·80	401·43
		JERSEYS.				
Two-year-old Class.						
Miro	A. A. Ward, Miro, Taranaki	2 357	276·2	365	8835·70	548·69
Belvedere Berry ..	E. Eagle, jun., Belvedere	1 361	240·5	336	8064·50	395·40
Snow Bird	C. A. Willis, Pukekohe	2 5	241·0	352	8135·00	395·16
Belvedere Maid ..	E. Eagle, jun., Belvedere	2 1	240·6	333	6550·50	379·07
Maud Lambert ..	F. Strange, Mangaiti ..	2 362	276·7	331	6733·40	345·16
Lady Hope III ..	C. Stevens, Maungatapere	2 146	255·1	363	5653·70	319·80
Consolation ..	E. S. Holdaway, Ballance	1 344	240·5	365	5792·80	308·52
Tiritea Bonny Lass ..	E. S. Holdaway ..	2 318	272·3	356	5793·00	306·67
Belle of Bull's ..	Dr. F. J. Watson, Bull's	2 44	244·9	339	5492·60	294·01
Waitoa	T. Foreman, Alton ..	2 6	241·1	303	4558·30	286·04
Olga's Chase ..	W. J. Hall, Matatoki ..	2 46	245·1	360	5102·70	282·46
Three-year-old Class.						
Bright Star II ..	S. R. Lancaster, Palmerston North	3 356	312·6	328	8762·60	542·86
Floss V	J. A. McCrea, Palmerston North	3 6	277·6	327	9806·00	488·13
Lady Blizzard II ..	Messrs. A. and J. O'Donnell, Inaha	3 350	312·0	351	7527·90	425·37
Fairy Chase ..	W. J. Hall, Matatoki ..	3 61	283·1	365	6583·90	367·95
Ava	C. Stevens, Maungatapere	3 91	286·1	363	6115·90	366·40
Snowfall	E. McC. Tapp, Te Papapa	3 60	283·0	318	6560·05	329·38
Allie	C. Stevens	3 98	286·8	344	5466·70	327·65
Four-year-old Class.						
Hazeline	W. J. Hall, Matatoki	4 220	335·5	331	7327·20	449·09
Palm-tree	E. Griffiths, New Plymouth	4 15	315·0	364	6846·50	411·70
Crystal	W. J. Hall	4 102	323·7	303	6710·40	404·93
Princess May ..	W. J. Hall	4 43	317·8	321	7233·10	372·09
Mary Dean ..	W. J. Hall	4 93	322·8	326	5566·20	352·77
Five-year-old Class.						
Madam Mayflower ..	H. B. Curtis, Inglewood	5 307	350·0	365	11793·20	763·41
Sabean III ..	T. S. Edwardes, Tiakitahuna	7 45	350·0	365	11008·75	625·38
Duchess of Lavington	H. E. B. Watson, Tai Tapu	7 319	350·0	365	11483·00	600·16

Name of Cow.	Name and Address of Owner.	Age at starting Test.	Fat req'd. Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS—*continued*					
Five-year-old Class—contd.		Y. dys.	lb.		lb.	lb.
Silver Darkie ..	S. R. Lancaster, Palmerston North	8 49	350·0	348	10026·50	517·76
Whinflower ..	F. E. Hellyer, Dunedin	9 12	350·0	343	10386·85	514·24
Michaelmas Day ..	A. A. Ward, Miro ..	5 325	350·0	365	8281·70	480·78
Lady Olga	W. J. Hall, Matatoki	5 336	350·0	365	8296·50	471·15
Lady Carolina ..	T. Foreman, Alton ..	5 360	350·0	341	7438·50	470·81
Lady Hopeful ..	W. J. Hall, Matatoki	5 250	350·0	358	7700·20	451·87
Up-to-date ..	A. A. Ward, Miro ..	5 348	350·0	365	7556·80	420·90
Monica	H. B. Curtis, Inglewood	6 359	350·0	361	7446·70	420·82
Ruth II	R. J. Linn, Normanby	6 53	350·0	307	7803·20	390·98
Queen Bee	A. Blackman, Cambridge	11 315	350·0	310	8106·75	389·41
Ravenswood Beauty	S. R. Lancaster, Palmerston North	7 258	350·0	283	7514·50	389·29
Mabel of Concord ..	W. J. Hall	6 57	350·0	350	7208·80	381·34
Moira	C. Stevens, Maungatapere	6 33	350·0	310	5982·50	363·21
St. Lambert's Daisy ..	W. J. Hall	13 4	350·0	313	6726·10	357·35

MOUMAHAKI SWEDE TESTS.

REPORT ON THE PAST SEASON'S EXPERIMENTS.

T. W. LONSDALE.

THE swede crop of the Moumahaki Experimental Farm of the past season was sown in field No. 20, on the 23rd and 24th of December, 1913. This field had been in wheat and barley during the previous season. White mustard was sown on the stubble, and the resultant crop of self-sown grain and mustard was ploughed under in late autumn as green manure. Peas and oats were then sown, and the crop was grazed with sheep until the field was disc-ploughed during early November. The swedes were sown on ridges during the third week in December, and the ridges were rolled after sowing. This latter operation somewhat detracts from the appearance of the field, but is very effectual in firming the ridges, and thus improving the supply of capillary moisture for the germinating seed and the young seedlings. All varieties germinated well.

A rather heavy dressing of artificials was applied, but as it was intended to sow this field down to lucerne during the 1914 season the residue will be a benefit to this crop. The mixtures of fertilizers sown from the front box of the ridger—*i.e.*, sown on the flat under the ridge—consisted of 2 cwt. of basic slag, 2 cwt. of Malden Island guano, and ½ cwt. sulphate of potash an acre. From

the back box of the ridger—*i.e.*, sown on the ridge—1 cwt. of superphosphate an acre. The crop came away well, and was intercultivated three times.

The produce of 135 single plant selections of Garton's Superlative swede was sown, and these yielded some splendid roots for seeding purposes. Selection of this variety has been undertaken with a view to isolating strains exhibiting a high degree of resistance to club-root or finger-and-toe (*Plasmodiophora brassicæ*). Portion of the field was fenced off and used for a palatability test with sheep. It was difficult to pick upon one variety as being first consumed, but Sutton's Magnum Bonum, Garton's Superlative, Hurst's Best of All, Hurst's Purple-top Stubble, Hurst's Monarch Purple-top, Webb's New Buffalo, and Webb's Perfection Purple-top received first consideration. Sutton's Bronze-top was distinctly the least appreciated.

Appended are the results of the variety trials—

Variety.	Yield in Tons per Acre.		
	Roots.	Tops.	Total.
Garton's Superlative	40·02	4·48	44·50
Webb's New Buffalo	35·91	5·16	41·07
Hurst's Halewood Bronze-top	33·87	5·71	39·58
Hurst's Best of All	35·37	4·08	39·45
Garton's Incomparable	34·55	4·89	39·44
Sutton's Magnum Bonum	34·14	5·17	39·31
Sutton's Crimson King	33·46	4·89	38·35
Webb's New Empire	32·97	5·03	38·00
Webb's Perfection Purple-top	34·14	3·67	37·81
Sutton's Bronze-top	32·10	3·67	35·77
Hurst's Gateacre	31·33	4·08	35·41
Webb's New Imperial	30·74	4·62	35·36
Hurst's Golden Melon	31·00	3·81	34·81
Hurst's Purple-top Stubble	29·38	5·03	34·41
Sutton's Queen	30·74	3·53	34·27
Sutton's Up-to-Date	30·25	3·94	34·19
Hurst's May Day Bronze-top	30·06	3·94	34·00
Hurst's Monarch	28·43	4·21	32·64
Hurst's John Bull	28·29	3·40	31·69

On the 7th February, 1914, nitrate of soda, at the rate of 1 cwt. per acre, was applied as a top-dressing, with the following results :—

	Tons per Acre.		
	Roots.	Tops.	Total.
Top-dressed with 1 cwt. nitrate of soda yielded at the rate of ..	37·40	4·35	41·75
Plot undressed	30·05	3·14	33·19
Difference in favour of nitrate of soda	7·35	1·21	8·56

This is the result of one season's trial, and as such is deemed worthy of record. A further trial will be undertaken during the coming season.

TERMS EMPLOYED IN WINE ANALYSES.

S. F. Anderson.

It frequently happens that a winemaker requires an analysis of his wine, in order that he may know just what he is doing in the making process, and that he may be able to inform an intending purchaser of its alcoholic strength, acidity, &c. Taking the following report as an example of what is sent to him, it may be asked what the terms employed mean. It is proposed, therefore, to explain them in a way that will be clear to the ordinary cellarman and winemaker.

Example of a Report on a Sample of Wine.

Wine, Pinot meunier, vintage, 1908.

(1.) Specific gravity of distillate	0·9820
(2.) Percentage of absolute alcohol by weight	11·45
(3.) Percentage of absolute alcohol by volume	14·10
(4.) Percentage of proof spirit	24·70
(5.) Acidity as tartaric acid ..	6 per 1,000

These will be taken in the above order.

(1.) *Specific Gravity.*—In this case specific gravity represents the relative weight of a certain volume of spirit when compared with an equal volume of distilled water at a temperature of 60° Fahrenheit or 15·5° centigrade. Other liquids besides water have buoyancy, each liquid having its own peculiar amount of buoyancy. For instance, a syrup or brine would be heavier, while oils and alcohol, or liquids containing these substances, would be lighter than water. Thus, the specific gravity of absolute alcohol is 0·7938. This expresses the fact that bulk for bulk absolute alcohol is $\frac{7938}{10000}$ of the weight of distilled water at a temperature of 60° Fahrenheit. The amount of alcohol contained in a wine is ascertained by distillation. Distillation is necessary in order to separate other substances from the wine which would affect the true results. The method of doing this is described in text-books on chemistry. The specific gravity of absolute alcohol at 60° Fahrenheit is given in "A Treatise on Alcohol," by Thomas Stevenson, M.D., as 0·7938, and that of water at 60° Fahrenheit equals 10,000. The alcohol or spirit tables in the above treatise give the alcoholic strength corresponding to a given specific gravity. In the

analysis under review the specific gravity is given as 0·9820. This brings us to—

(2.) *The Percentage of Absolute Alcohol by Weight.*—On reference to the tables mentioned above it will be found that a specific gravity of 0·9820 corresponds with 11·45 of absolute alcohol by weight per cent. That is, in 100 lb. weight of the wine there will be 11·45 or $11\frac{9}{20}$ lb. of absolute alcohol.

(3.) *The Percentage of Absolute Alcohol by Volume or Measure corresponding to a Specific Gravity of 0·9820.*—This means that where the specific gravity is given as 0·9820, the percentage of absolute alcohol by volume is 14·10: that is, in every 100 gallons of wine there will be $14\frac{1}{10}$ gallons of absolute alcohol.

(4.) *The Percentage of Proof Spirit corresponding to a Specific Gravity of 0·9820.*—Proof spirit is the term used in estimating the alcoholic strength of any spirituous liquor upon which Customs duty is charged. It is defined by Act of Parliament to be such as shall at a temperature of 60° Fahrenheit weigh twelve-thirteenths ($\frac{12}{13}$) parts of distilled water: that is to say, 12 gallons of distilled water at the above temperature weigh the same as 13 gallons of a liquor of proof-spirit strength. Putting it another way, in 1,000 parts of a liquor of proof-spirit strength there is 0·5727 part of absolute alcohol, and 0·4273 part of water.

(5.) *Acidity as Tartaric Acid.*—The amount of tartaric acid in wine or must is determined by the quantity of an alkaline solution of fixed strength required to neutarlize it. It may be lime-water or a caustic-soda solution. This is dropped into a given quantity of the wine or must until the neutral point is reached, the neutral point being that when it is applied to blue litmus paper it ceases to turn it red and it remains blue. In the above report the acidity is given as 6 per 1,000: that is, in every 1,000 parts of wine there are 6 parts of tartaric acid.

Annual Sale of Weraroa Bull Calves.—The twenty-two bull calves offered by auction at the Weraroa Experimental Farm on the 3rd November realized 878 guineas, an average of nearly 40 guineas, the sixteen Holsteins averaging just on 35 guineas, and the six Shorthorns averaging a little over 53 guineas. The highest-priced Holstein was the son of Spot (a cow giving milk-testing 4 per cent. or a shade over), by Woodcrest Joe, Mr. G. Gardiner, of North Canterbury, paying 150 guineas for him. The same buyer also paid 56 guineas for a grandson of Domino III. The best price obtained for a Shorthorn bull was 85 guineas.

WORK FOR THE COMING MONTH.

NEW ZEALAND is a country of wide variation in climatic and soil conditions. In applying suggested procedure it is, therefore, necessary for the farmer to amend it to suit local weather-conditions and the requirements of his soil—information which can best be ascertained by a study of these problems on the part of the farmer himself. Nothing can take the place of local knowledge. Little advice on an agricultural subject is capable of general application in its entirety.

THE FARM.

PRIMROSE MCCONNELL.

AT the date of writing the abnormally dry weather still obtains, the conditions resembling January rather than November. The position has become somewhat critical. Except on very rich soil pastures have not formed any bottom grass, with the result that they stand very little grazing. The unseasonable drought has also kept early-sown forage crops in check, and in some localities the soil has been so dry that the seed has not yet germinated. Lucerne is the one unfailing stopgap, and the farmer who possesses a good area of this invaluable fodder will more than ever realize that he holds something even more precious than gold itself.

Milk cheques are becoming smaller when they should be at their largest; but such seasons do good, although in an unpleasant manner, because they stimulate farmers to look ahead and prepare for eventualities, instead of living on the hand-to-mouth system. Should the dry weather continue much longer, hay and cereal crops will be light, and not a straw should be wasted, as all available fodder may be required this coming winter. Every kind of cereal straw, also pea and bean straw, may be used as fodder, and when chaffed and mixed with a little treacle and a handful of crushed grain makes very palatable material.

The question naturally arises, "What is the best forage crop to sow now?" Under the circumstances something bulky is required, and in suitable localities maize is perhaps the best, as 40 tons per acre may be grown under liberal treatment. Some may be used as green forage, and the remainder made into ensilage.

Queries often come to hand *re* stack-ensilage making, and as no one of practical experience will question the value of ensilage in

a droughty season, the following directions may be found useful. The best time to cut maize for ensilage is when the lower leaves are turning yellow and the cobs rather past the milk stage. If not too tall, it may be cut with the binder, and it should be conveyed to the stack without loss of time. When mechanical appliances are not available it is of great advantage to select a site on sloping ground, so that one end of the stack may be built close up to the necessary excavation and the material forked with a minimum of labour from the highest point. In any case maize, if well grown, should be tied in sheaves, because they settle more solidly on the stack than when forked up loose. A hoist of some sort is nevertheless a great boon, and the necessary outlay is not enormous. Any rubbish may be used for the stack foundation. The stack should be nearly square, and the sides kept perfectly perpendicular, and, as the sheaves are placed in position, the twine should be cut, thus allowing the stalks to settle more closely together. Maize-stalks being very coarse, the air penetrates farther than in any other ensilage material, and for this reason it is necessary that the outsides of the stack be trodden down as firmly as possible. Where the air penetrates the ensilage will be of no value as fodder. If finer material, such as grass, clover, or tares, is available to mix with the maize-stalks the air-spaces are better filled, and the waste proportionately less.

In the face of a shortage of hay, a fair substitute may be found in Japanese millet, which should be sown at once, and, although the material is coarse in comparison to pasture grass, it makes passable hay if cut at the right stage and stacked in good condition. It also makes good green forage, but the weight per acre is only about half that of maize. For this plant a fine seed-bed is necessary, but, being small, the seed should not be covered deeply. It may be sown broadcast, after the Cambridge roller, at the rate of 10 lb. per acre, and covered in with a light tine or chain harrow. The manure advised for maize in last issue of the *Journal* will be found to answer well for millet. This is a crop which should not be sown in any season until the warm weather has fairly set in. November is soon enough. It must be admitted, however, that neither of the above-mentioned forage plants can take the place of a good stand of lucerne, and every farmer, particularly those farming a small area, and poultry-farmer should have a considerable percentage of his land under this crop.

The season has been excellent for cleaning weedy land, particularly that infested with such weeds as couch-grass. The cultivator and tine harrow are much better for this purpose than the disc.

Shallow intercultivation should be carried out at intervals. It cannot be done too often.

Weedy potatoes should be hand-hoed, and as soon as the tops reach a height of about 6 in. the first spraying should be carried out. It must be borne in mind that spraying is of the utmost importance in cultivating the early potato crop, and it should be done before the disease is in evidence. Even where there is no disease, spraying lengthens the growing period and increases the weight of tubers per acre. For the late and more vigorous-growing varieties it is not of such vital importance.

In the earlier districts haymaking will be in full swing. The best time to cut is when the plants are in the flowering stage—rather before than later—because when the seeds are allowed to ripen before the crop is cut the resulting hay is of inferior quality, much of the nutriment having passed into the seed. The coarser the material the less drying is required, and when the crop is light, the hay coarse, and the weather good, cutting may be done on one day and the windrowing the next. Clovers and lucerne take much longer fielding, and it is a good plan to put the hay into cock as soon as sufficiently wilted. It is not often that hay is damaged by stacking it when it contains a little of its own sap, but it should never be stacked when it contains any rain-water. Haymaking is work that is only learned by practice, and while well-got hay is of very great value, the badly got serves only to appease hunger, and if badly moulded may do a great deal of harm. Up-to-date implements make haymaking a light matter in comparison to what it was twenty years ago, and every farmer who makes hay in quantity should possess a horse-rake, sweep, and lift.

Swede-sowing will be about completed this month, and in connection with the prevention of club-root or finger-and-toe in this crop an account of interesting and valuable experiments carried out at Dalmeny Park, Scotland, by Mr. A. L. Drysdale has just come to hand. After much experiment it has been proved beyond any doubt that an application of 1 ton of ground burnt lime per acre just before ploughing, and another ton immediately after, with a mixture of ground phosphates or other phosphatic manure not treated with sulphuric acid, 8 cwt. kainit, and 1 cwt. sulphate of ammonia, applied as manure, is an effectual cure or preventive, and acts at once. Mr. Drysdale also recommends that no dissolved manures (such as superphosphate), nitrate of potash, nitrate of soda, or farmyard manure should be applied to land that is subject to club-root.

The above formula will also be of much value in dealing with other fungoid diseases, as all such are stimulated by a condition of acidity in the soil. In no part of the world has experimental work been carried out on such practical and reliable lines as at Dalmeny Park, and although Mr. Drysdale occasionally ignores the text-book, the great value of his work has been placed beyond any doubt, and his recently issued book, "Greater Profits from Land," is one which may be read with profit by the greatest scientists. In studying this work, however, it is well to remember that the conditions in Scotland are much different from those obtaining in New Zealand.

In connection with the dairy herd, everything possible should be done to prevent a decrease in the milk-flow, because if there is a serious reduction so early in the season it will be extremely difficult to make up for lost ground later on. At Ruakura a supply of mangels was available until the end of October, since which date the cows have received a daily ration of green lucerne, and the writer's advice to every dairyman is, "Sow lucerne, and sow it in quantity."

THE ORCHARD.

W. A. Boucher.

Cultivation necessary.

The day is past when the poorly cultivated orchard can be made a commercial success. In the summer the cultivator should be kept going, for, apart from thus keeping down all foreign growth, moisture is conserved by the mulch thereby induced, and the trees are given full opportunity to develop and mature their fruit. In the orchard in which cultivation is neglected there is almost invariably to be found pests and disease, for which the neglected growth of grass and weeds is a good harbour. It is useless spraying fruit-trees thoroughly if other growths which may attract the pests being fought are allowed to run riot.

Apple and Pear Scab.

December is generally a period when apple and pear scab gives most trouble, the extent of the visitation usually depending upon the climatic conditions ruling. As emphasized before, a moist atmosphere favours the pest; a dry one is unfavourable to it.

The grower must use his own discretion as to the advisability or otherwise of further spraying. Of course, in the event of wet weather, it will be necessary to repeat spraying with the Bordeaux mixture of the summer formula.

Codlin-moth.

Continued spraying with arsenate of lead, as described in last month's *Journal*, is very necessary in most districts at the end of this month, as many moths will doubtless then be on the wing. The number of eggs laid increases as the weather becomes warmer, and as the period of incubation is covered by seven to ten days, according to climatic conditions, it is dangerous to delay control work. A dry season naturally favours an early appearance of the pest, and growers would be therefore well advised to commence their spraying operations at an early date.

Bronze Beetle.

Last season this pest gave considerable trouble, but those growers who took the precaution to fight the pest in advance by the combined arsenate-of-lead and resin solution suffered little from its depredations. Those, however, who waited to attack the beetle when it was already troublesome suffered for their failure to get to work at the right time—that is, before it became established. No doubt many of those who suffered last year and have not forgotten their experience will now appreciate the truth of the old saying that prevention is better than cure.

Leech.

Those who grow pears, plums, and cherries will require to remember the leech pest about this time. Where systematic spraying has been carried out for codlin-moth, and the arsenate-of-lead spray has also been applied to the plum and cherry trees, this treatment will be all that is required. With varieties of cherries and plums the foliage of which is found to be affected by the arsenate-of-lead spray of the ordinary strength a weak solution should be employed.

Peach-aphis.

Where treatment of this pest has been neglected up to now it may not be too late to attack it if this is done at once. Spray with McDougall's insecticide as directed.

GRAPE-CULTURE.

S. F. Anderson.

A few notes will be given this month on the most common diseases met with in growing vines under glass, and how to avoid them.

Vines are grown under glass because the conditions of growth can be controlled and varieties grown to the same perfection they attain in the land of their origin. When strong-growing plants are crowded into a small space, and that space covered in, it is natural that unhealthy conditions must soon come about unless care and attention are duly provided. For the first year or two, owing to their strong vitality, this is not so noticeable, but in later years the cropping, pruning, attention to pests, manuring, and cultivation require greater care and skill to maintain regular excellence of the fruit. Although the vines and fruit can be brought to great perfection in glasshouses, there is a considerable difference in the texture of the leaves and stems of vines grown in the open and those raised under glass—a toughness and hardness that enables vines grown out-of-doors to resist sudden changes in climatic conditions. Grown under glass, unless proper care be exercised, there will be scalding of the leaves, shanking of fruit, and deficiency of colour. Grown out-of-doors in their natural habitat, these troubles are not met with.

At this season of the year the first trouble likely to be expected is mildew (*Oidium Tuckerii*). Fungoid diseases have now to be reckoned with in the cultivation of all plants. These diseases require preventive treatment. The preventive in the case of vine-mildew is sulphur. The general method is dusting it on by means of bellows or throwing it over the whole plant from time to time during the growing season. Another way—recommended by Mr. W. H. Taylor in the *Journal* of last January—is: A handful of sulphur is thrown into a kerosene-tin and is then mixed with a little milk in just sufficient quantity to make a stiff paste, care being taken to remove all lumps. Of course, the milk should not be sour. Then fill up the tin with tepid water and spray on in the usual way. This method can only be used in the earlier stages of growth. Another excellent way, recommended by L. C. Corbett, is: Procure a kerosene-stove. Over the flame of this stove is placed an ordinary cake-tin. In this a quantity of sand sufficient to make

a layer half an inch deep is placed. The sulphur is then put into a second and smaller pan and placed upon the sand in the larger. In this way heat sufficient to keep the sulphur melted is secured without danger of its becoming overheated and igniting. The fumes are given off in great abundance. In this way the sulphur is distilled or volatilized, and deposited on the vines. When the house is filled with the fumes the heater can be turned down. This is the best method of killing red spider.

Scalding of the Leaves.—This is caused by a hot sun coming on leaves laden with moisture, and possibly after a low temperature, in the early morning. Where there is some circulation of air it is not so likely to occur unless the leaves are touching the glass. In the cool vinehouse the top ventilators, unless a very cold wind is blowing, can always be left open an inch or so at night.

Scalding of the Berries.—This, too, is brought about on the tender-skinned varieties of grapes by the same cause as that given for scalding the leaves. It is often, however, the result of leaving the stopping or pinching of the shoots until they have made a strong growth and then stripping the vines to a harmful extent, and laying bare to the hot sun fruit that previously had been shaded. It does not often occur in well-managed houses.

Mealy Bug (Dactylopius adonidum).—The treatment for this pest—the worst of all under glass—has been fully explained in Bulletin No. 40, and also in the *Journal* for February, 1913, and would be too long to repeat in these notes.

Red Spider (Bryobia pratensis).—This is a troublesome insect when once it gets a footing in the vinehouse. Where the conditions are fairly moist it rarely makes its appearance. There are, however, dry districts where it nearly always can be looked for. Syringing the vines and wetting the floor keeps it under. If very troublesome, use the sulphur-fumes applied as advised under the treatment for mildew.

Shanking.—This trouble can generally be traced to conditions in or about the vinehouse that should never occur, such as cutting off large quantities of foliage instead of doing it gradually at the proper time. Overcropping the vine, too deep and not sufficiently drained vine-borders, applying large quantities of rank strong manure, irregularity or extremes of temperature, and injury from insects are all causes or contributing causes of shanking. There is no cure: it must be prevented.

THE APIARY.

F. A. Jacobsen.

A Seasonable Hint.

One lesson of experience is that it pays handsomely to give bees every attention and care. The most successful men are those who do not neglect them in the smallest degree. As young queens are necessary to obtain the maximum surplus of honey, I shall repeat some information relative to queen-rearing formerly given in the *Journal*.

A Nucleus Hive.

Nucleus hives are used in the spring for the purpose of mating virgin queens and disposing of queen-cells. As the name indicates, it is a small hive, which contains from two to four frames, but the most popular one contains three. A convenient way of making these small hives is to divide a super into three equal parts, with wooden partitions one-eighth of an inch in thickness. Should a ten-framed super be divided like this, each compartment would easily hold three frames, while the narrow division-board between each small colony enables the heat to penetrate from one division to the other. Each division or compartment must have its own entrance, and these entrances are made by boring a hole near the bottom of the super on each side and at one end. Nucleus hives are sometimes made independently of one another, and have just sufficient room to contain the usual three frames. Some bee-keepers prefer these individual hives, but in many ways they are not so convenient as the three in one.

Forming Nucleus Colonies.

The object of having nucleus colonies having been previously stated, a description of how to form them may prove useful. A strong colony is the best to select, as more small colonies can be formed from a strong hive than from a weak one. Proceed, then, to a strong hive and puff a little smoke in at the entrance to quieten the bees. Remove the cover and lift out the frames with the adhering bees, placing one comb containing brood, one containing pollen and honey, and the third an empty comb, in each nucleus. A strong colony should make five or six nuclei. Next close the entrances of these small colonies, and remove them to a cool place to remain there until the next day, when they can be set out in the position required. Always leave one nucleus on the old stand to catch flying bees, and do not close this one up. For

this purpose the old hive could be used, but the inside space should be contracted by division-boards.

Inserting Queen-cells.

A queen hatches from her cell in about fifteen days and a half from the time the egg is laid; therefore the best time to make nuclei is when the cells are about twelve or thirteen days old. Immediately after the formation of the small colony insert a queen-cell, which must be confined in a West cell-protector and placed on the centre comb, then close the hive.

The Wedding Flight.

If the larva in the queen-cell is thirteen days old when inserted in the nucleus, the virgin queen should hatch in from two to three days. Five or six days later, weather permitting, she will take her mating flight and return to the hive fertilized. Four days after this meeting with the drone she will commence to lay, and may then be used for the requeening of full stocks, &c.

Disposal of Nuclei.

After the nuclei have served their purpose they should be united to make fairly strong colonies. Failing this, they may be united with any very weak stocks in the apiary. Those containing queens that have not been used may be wintered over to the following spring, and then united with any queenless colonies.

Swarm-control.

Every effort should be made to keep down swarming in the manner indicated in previous issues of the *Journal*. It is only strong powerful colonies which gather a valuable surplus of honey.

THE POULTRY-YARD.

F. C. Brown.

The man who has managed things well will have the work of chicken-rearing practically over by December, at least before the holidays. With hatching and brooding at an end, and the chickens at a safe age or able to look after themselves, it should not be thought that it is a good time to take things easy. There are certainly busy periods in the poultry year, but every opportunity should be taken in the slack intervals to do the many little things

about the place which cannot be done at other times for want of opportunity. As soon as the last of the chickens are "on their own," that important matter at this season of the year, fighting vermin and bacterial life, should be taken up in a vigorous and determined manner. There should be no half-measures about it. Thoroughly spraying the houses with a strong disinfectant, making sure that the mixture gets into every crack and crevice, is the first thing to do. Do not neglect to keep the nests, dropping-boards, and perches—those favourite resorts for vermin—in a good sanitary state, while dusting-places, preferably in a shady quarter, should be provided wherever possible. There is no place where a bird likes so much to dust herself as under a tree where the soil has been newly turned over. Spraying will check red mite, fleas, &c., but as "body vermin" live on the fowl, it is only by dusting itself in the loose earth (or sand, ashes, &c.) that the bird will be able to rid itself of these. Young birds will require these dusting facilities as well as the old ones. The brooders and broody coops should be cleaned, and if necessary repaired; while it pays well to generally straighten up things and put everything into smooth running-order for the busier months ahead. Do not on any account forget shade for the warmer months. If shrubs and hedges have not been provided, make some rough shelter out of odd pieces of timber or branches of trees; sacking, &c., may be utilized for the purpose. Capital shade may be secured by erecting short manuka-scrub fences in the form of a cross, so that the birds may have shade, and shelter as well, at any time of the day and in any weather. All classes of stock demand shade in the hot weather. It is quite a common question put to me by summer correspondents, "What makes my hens run round and round?" The trouble, of course, is vertigo, a dizziness affecting birds which come unprotected under the influence of a strong sun, especially with highly-fed fowls and those carrying exceptionally heavy combs. Young ducks will never thrive in the absence of shade. They are very prone to sunstroke. Affected ducks will be observed to stagger, fall on their backs, with the eyes twitching, and present a generally distressed appearance. A cure can often be effected by dipping the head in cold water, but this will not prevent a recurrence of the trouble. Shelter must be provided at once. Ducklings which have had too much heat in the brooder stage will sometimes become affected in a similar way. Apart from these direct evidences of the ill effects of the sun's rays beating down on feathered stock which cannot escape from it, the fact should be obvious to any one who will use his reasoning powers that young stock can hardly be expected to make satisfactory development if

they are not maintained in comfort and in a condition in which the least drain is made on their energy.

An Expensive Present-day Leak.

If a record could be obtained at the present time of the amount of fowl-food consumed by sparrows it would, I am sure, run into startling figures. The loss from this cause is considerable in ordinary seasons, but at the present time, with the high cost of foodstuffs, it will seriously reduce the profits of many poultrymen, especially those who do not possess the approved open-front house (the front being covered with $\frac{3}{4}$ in. wire netting), and are compelled to feed the birds in the runs. In hot trying weather fowls, especially where there is not ample shade, are very apt to go off their food or eat only a little at a time. It is then the small bird makes his heaviest toll. If the fowls have to be fed outside, it is as well to remove any unconsumed food about fifteen to twenty minutes after the food is put down to them.

Injurious Effect of Salt.

Too many people are not aware that poultry cannot tolerate a heavy supply of salt—indeed, it is questionable if salt, in however small an amount, is required by feathered stock. I recently investigated a case where nearly thirty fowls had died from, it was said, a mysterious cause. On examination of some of the birds I at once suspected poisoning, as the crops were full of feed and the bodies appeared to be very well nourished and presented no indication whatever of disease. I at once inquired as to the nature of the feeding. I was informed that a salted pig's head which had been boiled was given to the fowls on the day on which the mortality occurred, soup in which the head was boiled having been used to mix the morning mash for the day in question. These are not by any means the first cases which have come under my notice where salt has caused heavy mortality among poultry. Probably salt has been the cause of death in many other cases upon which I have been asked for advice by letter, but the necessary symptoms and particulars not having been forwarded to me I have not been able to lay my finger on the trouble. In asking my opinion on such matters correspondents should give as complete an account as possible of the feeding and surrounding circumstances of the birds.

Losses in Chickens.

Many artificially reared chickens are lost every season owing to pure carelessness, though in a good number of cases the cause has

been due to the owner failing to realize what a chicken will swallow when there is no mother hen to correct him. The importance was recently emphasized in these notes of opening up any dead chicken, to discover, if possible, the cause of death, in order that further mortality may be prevented. Judging by several cases which have recently come under my notice, the importance of this advice cannot be overestimated. In three cases during the past week I opened up dead chickens about a month old that had been sent to me. In the first case a 1¼ in. nail had pierced the gizzard. A thick inch screw was in the centre of the gizzard in the second case. In the third instance a ¾ in. staple was in the gizzard, with the two points piercing the sides. These interesting cases came from plants recently constructed, and the articles swallowed had been left lying about by the builders. They should emphasize the importance of keeping rubbish and dangerous matter beyond the reach of the orphan chicks, who have not attained the age when they can be trusted to look after themselves.

To Correspondents.

To advise any one through the columns of the *Journal* or to write to them direct is not always satisfactory, even when the inquirer has fully and accurately described his trouble. When, however, the position is only partially set out it is practically impossible to give any advice at all. The other day a Christchurch correspondent (who did not, by the way, give his name) asked if his fowls were sheltered enough in their roosting-place, which was 5 ft. 9 in. high and 8 ft. deep, being all open in the front; but he did not give the length of the house, the number of perches, or the number of birds kept in the house. No doubt he desires to know whether the house is sufficiently high and is deep enough. This is simply answered. Even if the sides and the ends of the building be absolutely draught-proof and the position (as he states it is) fairly sheltered, the depth of the house is quite insufficient for winter quarters; and even if it were boarded up for 2 ft. in front and ¾ in. wire netting placed above this, the depth would hardly be enough if more than one perch be used. The open-front house should be at least 12 ft. deep, and not less than 6 ft. 6 in. in height in front, and, unless in a specially favoured situation, should have a wind-break at least 2 ft. high along the bottom of the house-front. I advise ¾ in. wire netting, as it will then be possible to keep the sparrows out of the house and prevent them stealing the fowl-feed. The same correspondent says that most of his pullets (White Leghorns) moulted very badly right through till spring. Again no mention is made of the details, a

knowledge of which is necessary to arrive at a probable explanation of the difficulty. When were they hatched? Were their quarters frequently changed? Were they regularly and well fed? Was the class of food altered too often, or was it of the right quality? Were they overcrowded? Did they have ample dry scratching-quarters? Were green food and grit always available? Did they receive a regular supply of animal food? Even these questions do not cover the whole field of investigation probably necessary to furnish an accurate reply. I have dealt with the letter of this correspondent as it is not singular but very similar to many communications which reach me, and as the publicity given to it may make correspondents in general realize the importance of thoroughly describing any trouble on which they may desire enlightenment. In the case of disease every little warning symptom should be described, as well as the method of management, and especially the class of food supplied or any variation of this. I have been compelled to make long railway journeys to investigate mortality among fowls, only to find that if the full particulars of the food supplied had been given me in the first place my journey and loss of time would have been obviated, and the inquirer would have been able to check the death-rate before. Do not be afraid of worrying me with too many details.

THINGS TO REMEMBER.

Do not fail to keep the water-fountains clean and regularly filled at this season of the year.

Young stock cannot satisfactorily develop if placed in dirty or lice-infested quarters.

Cockerels should be separated from the pullets before they commence to crow.

Frequent removal of manure and spraying interiors of roosting-quarters with sheep-dip discourages vermin and wards off disease.

Cockerels and other stock intended for Christmas markets should have their exercise curtailed, and be given as much soft food as they will eat.

Profits will be reduced by not placing in the broody-coops birds showing the least sign of becoming broody.

Annoyance and disappointment are often avoided by having a system of marking the different strains and the ages of the stock.

Sunstroke is a common cause of loss with ducklings hatched in hot weather. Good shade will prevent it.

Leg-weakness in growing cockerels is mostly the result of confining them in restricted quarters.

THE GARDEN.

W. H. Taylor.

With the increase of motor vehicles stable manure is becoming more difficult to obtain, and though the farm garden may not be affected in this way, many of the readers of these articles are not farmers, or maybe they are fruit-farmers who do not stable horses. Stable manure is undoubtedly the best manure for a garden, and with plenty of it no other fertilizer is required. The necessity of the times, however, makes it imperative that we look to other substances, and a free use of artificial fertilizers must be made, or we must be satisfied with indifferent crops. It is as well that cultivators of gardens should realize that plants do not live on the soil and water. The soil is merely a medium for holding plant-food, and its cultivation is mainly with a view to rendering it a kindly rooting-place, where plants can search freely by means of their roots for the food they require. In a state of nature soils contain the elements of plant-food in varying quantities and kinds, but cropping soon deprives the soil of these elements, and means must be taken to restore it. In its natural state land is seldom in a condition to produce any and every crop in such a way as to maintain a supply of vegetables or flowers the year through. Yet this is what a garden should do, and in making it so is where the art of gardening begins. On many farms there is no garden. A corner of a field may be used to grow a few vegetables for domestic use, but this is subject to the uses of the field, and it may be available for only one crop, and even that may not be too certain. It may be too dry for it, or if a late crop it may be too wet. It is to do away with these uncertainties that a garden is made. In an establishment where there is a proper garden the gardener is not asked about the state of the weather, but is expected to supply all wants whatever the weather may be, and usually he does it. I say this merely to show that it is not necessary to go without vegetables because the weather is dry or wet. If proper measures are taken in preparation of the soil, vegetables and flowers can be grown in almost any circumstances of weather. Deep working is of the first importance. It prevents water lodging near the surface, which sours the soil by excluding air, and enables roots to run down away from the surface in dry weather. The mere breaking-up of the soil is not sufficient. Something must be put in to keep it open, for it soon runs together again. Also, there must be something for the roots to go down to get. It is a good plan to be always trenching a patch in some

part of the garden, so that there is always a trench open in which garden and house refuse of all kinds may be put. Cabbage-stumps are a nuisance about a place. If put in a heap they are likely to give out an unpleasant smell, dug in near the surface they are in the way, harbour slugs and wireworms—for they take years to decay, as there is a good deal of woody matter in them—but at the bottom of a trench they do excellent service. Weeds also, even couch-roots and sorrel-roots may be put in, with a certainty that they will perish and do good. This will sufficiently indicate what should be done to make a dry patch profitable, or a wet site into a good garden. In the latter case draining might also have to be done.

Artificial Manures.

The use of these is necessary, as before stated, and this is generally recognized. The difficulty is what quantities to use. The quantities usually stated for farm crops are not sufficient for gardens. Farm land is usually subject to rotation of crops and grass, and is not under continual cropping in the way a garden should be, so that all that is done as a rule is to give sufficient fertilizer to start the young plants, but more than that is necessary in the garden. The following table gives the quantities for a small area, which corresponds with certain weights per acre. It will be seen that amounts that sound formidable when speaking of acres are not so when considered in relation to the garden.

Per Acre.	Per Square Rood.	Per Square Yard.
1 cwt. ..	$\frac{3}{4}$ lb. ..	$\frac{3}{8}$ oz.
2 cwt. ..	$1\frac{1}{2}$ lb. ..	$\frac{3}{4}$ oz.
4 cwt. ..	3 lb. ..	$1\frac{1}{2}$ oz.
6 cwt. ..	$4\frac{1}{2}$ lb. ..	$2\frac{1}{4}$ oz.
8 cwt. ..	6 lb. ..	3 oz.

An increased use of artificial manures is bound to take place, for with increasing knowledge their value is better understood. They are comparatively cheap, involving very little labour in applying, and not filling the ground with weeds as stable and farmyard manure will do. At the same time it must be understood that humus must be supplied, if for no other reason than its mechanical effect on the soil—keeping this in good working-order and conserving moisture in dry weather. Therefore, where stable or farmyard manure is not plentiful no means of increasing the quantity of humus in the soil should be neglected, even while fertilizers are being used to supply plant-food. I believe that superphosphate and nitrate of soda are the most valuable to use in conjunction with moderate quantities of stable or farmyard

manure, but in the absence of these latter substances more fertilizers would be necessary or profitable, such as sulphate of potash, sulphate of ammonia, blood and bone, and basic slag. Nitrate of soda has long been recognized, and rightly I think, as being possessed of almost magical powers in the promotion of plant-growth.

Current Work among Vegetables.

Spring *cabbage* and *cauliflowers* are now, or should be, coming into use. Some varieties of *cabbage* are liable to bolt to seed without reaching a useful size, and *cauliflowers* incline to cease growing and button while very small. The evil is most prevalent on poorly fed land, but it will occur on soil heavily loaded with stable manure. Nitrate of soda should be applied before the check in growth is noticeable. Prevention is better than cure, and the nitrate will be well paid for in improved produce. 2 oz. per square yard will be sufficient. Apply it if possible when rain is falling. A similar application of nitrate will improve the quality of *lettuces*. As dry weather seems to be the general condition throughout the Dominion, too much attention cannot be paid to keeping a loose surface between growing crops. The inch or two of dry soil thus formed is an excellent mulch, while permitting the ingress of air with its fertilizing effects.

Onions for pickling may be provided by sowing seed of a white-skinned variety, like White Queen, during November. Sow thickly in drills, and do not thin the plants. The soil should be rather poor, worked to a fine tilth, then trodden firm, using no fertilizer. The secret of getting the pickling size is to sow only after hot weather sets fairly in. Semi-starve the bulbs by crowding. This shortens their life and they ripen quickly. It is important to sow the right kind, or shapely bulbs will be rather a matter of chance than design. All thinning of the ordinary crops of onions should be finished before now. It is quite a mistake to leave rows unthinned for the sake of drawing from them. Far better sow a small patch for the purpose.

Sow *peas* and *French beans* for succession. Sow *spinach* between the rows of peas and beans. If sown at the same time, the spinach will be past before it is in the way of the other crop. I always thought it a benefit to other crops to have the remains of the lines of spinach to dig in. This is so soft that it decays very quickly and is a help to other crops—much better than hoeing it up and raking it off.

All *broccoli, savoy,* and *Brussels sprouts* should be up by now. It is a good plan to prick the young plants out a few inches apart in a nurse-bed. They keep dwarf, and make much sturdier plants

than when left in the seed-beds, besides getting more strongly rooted. In most places the last week in November is time enough to sow *cabbage* for the winter supply. This may be regarded as the last thing to sow of the Brassica tribe. Anything of the kind sown late will not be likely to succeed. Brussels sprouts should be in their growing quarters early in December; early broccoli likewise. Planting of the later kinds and cabbages should take place early in January. If much later they will not come to proper size. The so-called cabbage-fly is sure to be a trouble if the summer is dry. Plants may be quite clean when put out, but if drought continues long they are sure to be attacked. The greatest harm is done when the attack begins while the plants are quite small, for the very simple reason that, being small, they are quickly destroyed. The few leaves become so enfeebled by the gnawing of the grubs that they cannot perform their functions. The chances of keeping them growing are much greater if good plants are put out, and, if for no other reason, it is wise to prick out the plants as suggested, for they make more leaves and become firmer in texture. Being more strongly rooted, they are better able to survive some amount of injury. The likelihood of attack from the fly affords a strong reason for getting plants out early. The time of the first attack differs with the season and locality, but never occurs very early. The moth has to hatch out first, and it does not do so till warm and dry weather is present. Then it lays its eggs on the plants. It is the grub from these eggs that does the harm. It is a matter of reason that a plant of some size is less easily destroyed than a small one. There is a good chance to save the crop if the first attack is on good-sized plants, for the large outer leaves are not materially injured by being perforated with a few holes. It is the young partly grown leaves in the centre that constitute the vulnerable point of attack, for if these are destroyed further progress is arrested. With a strongly growing plant these centre leaves may be saved by dusting them with hellebore powder, or spraying with vistolene, which I have found to be of service, or with arsenate of lead. It should be noted that plants started early have a good chance to succeed in a dry season, because they get some growth before the stress is felt. As they gain strength they send their roots down away from the dry surface—that is, if the soil has been prepared in a way that will allow them to do so. Fortunately it does not disarrange dates of coming into use if either Brussels sprouts or broccoli are planted extra early; they grow larger if weather allows, but come into use at the same time. But this does not apply to either cabbage or savoys. Plant these at the proper time and make the best of it.

Celery should be ready for planting before the month is out. It does not make really good growth until days begin to shorten, but it must be planted betimes or it will not make size. Poor soil will not grow celery, and it is useless to try to make it. Deep working and plenty of dung is necessary, but a compromise may be sometimes effected if the surface soil is rich but the ground has not been trenched. The celery may be planted on the surface instead of in trenches. It will require a little more room to mould up, and the very best heads cannot be got this way. Still it does fairly well, and it would be better than putting it in trenches unless the soil had been trenched. To simply dig a trench for the celery would not answer if the trench had to go into a clay subsoil.

Flower-culture.

The manner of planting the flower-garden should, to some extent at least, be in accordance with the taste of the owner, though it should be also ruled to some extent by local conditions and the extent of the ground. If a garden is small there will probably be a desire to get as much as possible out of it. If large, there will be more opportunity to develop fine specimens of the various subjects by allowing them more space. Briefly, it may be said that there are two styles of planting—one crowded, for effect *en masse*, the other where plants are treated separately by allowing each species or variety more space with a view to producing good specimens. Good specimens may be secured by the crowded method of planting, but not with the same certainty. By the crowded method I mean taking advantage of all the ground-space, and planting in such a way as to leave very little space unoccupied, a method that certainly produces the gayest display and gets most from a given space. This plan can be followed successfully only where the soil is in the best of condition, well drained—either naturally or by the necessary means—soil well worked, well manured, and of a nature that will not easily bind, for it must be recognized that with such planting there will be little opportunity for working the soil after planting and sowing is done. It is a matter of common-sense that if plants are crowded there will be necessity for more manure than if they are far apart. It is obvious that it would be bad policy to plant closely unless the condition of the soil is good in every way, but where conditions are suitable close planting is most satisfactory. A garden looks rich when well filled, and mutual shelter that is afforded is a strong point in favour of the plan. Completion of all schemes of planting should now be energetically sought.

Chrysanthemums should be got out as soon as possible, for they get soft with new growth at this time, and as the heat of the sun

is increasing they are more difficult to establish. When it is considered necessary to water the plants that are put out the most effectual way is to water thoroughly before quite filling the hole with soil, then immediately fill up with soil from the surface, which, being more or less dry, will act as a mulch, and moisture will be retained long enough to start the plants.

Dahlias: These should be ready for planting now, except, it may be, plants raised from cuttings this spring. Where a speciality is made of dahlia-growing it is usual to give them a quarter to themselves. The ground should have been well trenched or deeply dug, and plenty of manure worked in, for preference down below the first spit, the object being to encourage the roots to go deep in the soil, where they find moisture when the surface is dry. Surface feeding and watering brings the roots to the top, where they quickly suffer unless continually watered.

Delphiniums, or perennial larkspurs, as they are called, are one of the very finest races of herbaceous plants. They are also one of the easiest to grow provided they are protected from slugs, which are very partial to the young shoots when first appearing. Seedlings raised in spring would be unlikely to flower this season, or at best only very weakly. Seedlings raised last autumn, however, will flower well. These seedlings may cause disappointment unless their habit is understood. They grow very nicely till near the end of winter, or even later, and then apparently die. They do not die, however, but lose their leaves and remain dormant a short time. Keep the soil in the boxes moist and they soon spring into life again. Then as soon as possible take them up and prick out in other boxes or a nurse-bed. Leave them there for a few weeks to strengthen before finally planting them out in the garden in deeply worked free soil that is moderately rich.

Box-raised stuff of all kinds should be planted out at once. Always plant in the latter part of the day, where it can be managed, except on dull days, when it would be wise to get as much planting as possible done. It is only rarely profitable to plant during rain, this depending entirely on the nature of the soil, most varieties of soil being likely to become sticky and harsh if worked in any way while it is raining. Seed should never be sown while the soil is wet, and I would rather sow the day after rain when the surface has become partially dry than the day before rain, as heavy rain is likely to disturb the seed and to close the surface. This, again, depends on the nature of the soil, but is true of the generality.

All vacant places may be filled by sowing seeds if there are not plants enough; and, for that matter, it is a mistake to fill the garden entirely with box-raised plants, because they seldom consist

of anything but a few well-known half-hardy varieties, which, for all their beauty, are not everything.

Very many of the hardy annuals are quite as beautiful as the best of the half-hardy, and many of them make a rich and quick show. The godetias are gorgeous and beautiful also. Clarkias are not often grown: try some—they are worth it. Cosmidiums are good for cutting, nemophila makes a pretty edging, kaulfussia a little farther back, portulaca in a sunny place on the margin, dwarf nasturtiums where the soil is poor and aspect sunny, mignonette in good free soil, scattered on the top and just scratched in. Then cornflowers, sweet-sultan, gillias, linarias, streptosolen, and many others. The forementioned half-hardy annuals can in most places be sown in the open with good results. The mistake that is frequently the cause of failure with both plants and seeds is putting them out too early. Seldom indeed is anything gained by too early sowing or planting. Once in years a phenomenal spring may make it successful, but normal weather—and we have no right to expect anything else—brings failure.

Violets: The proper time to plant is as soon as possible after flowering is over. Autumn planting usually ends in failure, at least of a degree. If planting is still to be done, see to it at once. Choose young offsets for planting. Cut off the large leaves: they are bound to die in any case. Plant in well-worked, fairly rich soil. It is quite important that the soil be such as will allow of deep rooting. Violets make a good many roots, and very narrow strips of soil are not suitable. Beds, or the margin of a good border, are congenial situations. Probably they do best when not exposed to the full glare of the sun all day in summer, but they require a fair amount of sunshine.

Bulbs that flowered early will soon be looking a bit sear, as far as foliage is concerned. Thoughtless people often cut it off, thus ruining the bulbs. The foliage should remain till nearly dead at least. Tulips should be lifted before the foliage is quite dead, but it must be nearly so. The outer covering of a tulip bulb is a brown envelope, provided by nature to protect the bulb during its resting period. This envelope clings loosely about the bulb if it is left in the ground, but if it is lifted after the foliage is quite dead this envelope usually falls off and a white skin is exhibited. It is important to retain the brown envelope. The bulbs must be lifted before the foliage is quite dead. Lay them to dry with the foliage on, only removing it when quite dead. Hyacinths may be treated in the same manner. Other bulbs should remain in the ground till the foliage is dead.

Flowering-shrubs should be pruned as soon as they have finished flowering.

THE HEMP INDUSTRY.

W. H. Ferris.

The phormium-fibre industry is feeling the effects of the war probably more seriously than any other branch of primary production in this country. During the quarter ending in September only 14,899 bales of hemp were milled, as against 28,651 bales in the corresponding quarter of last year, and this notwithstanding a much more favourable period for milling this year, combined with a better supply of a higher-quality fibre. The decline in production will be more rapid from now on, as the majority of the mills which have been operating have been only operating in order to complete contracts. In some districts milling has practically ceased. The following table, giving the grading returns for the first four months of the season, will convey a good idea of the relative production of this year compared with that of last year:—

		Sup.	Fine.	G. Fair.	H. Fair.	L. Fair.	Com.	Rej.	Con.	Total.
July	1913		157	2,148	6,744		390	37	11	9,487
	1914		42	794	1,943	1,213	78	10	..	4,080
Aug.	1913		73	1,748	5,891		417	24	..	8,153
	1914		46	1,675	2,532	617	95	40	..	5,003
Sept.	1913		89	3,227	7,026		576	93	..	11,011
	1914 ..	4	84	2,210	2,737	640	70	9	62	5,816
Oct.	1913		35	4,168	5,983	2,717	476	48	20	13,447
	1914 ..	7	177	2,712	2,397	625	99	16	..	6,033

Grand total for four months ending October, 1913, 42,098 bales; for four months ending October, 1914, 20,932 bales.

The standard of the hemp which has reached the grading-stores is distinctly in advance of that of last year. The increase in the percentage of good-fair produced in the quarter ending September over the corresponding quarter of last year was 7 per cent., the percentage in the former quarter being 31·31, and that in the latter 24·45. In the month of September the hemp graded at the port of Foxton contained 64 per cent. of good-fair quality. A reason largely responsible for the better-quality hemp milled this year is the greatly improved leaf now available, there being little evidence of the diseased leaf which was so common last season.

A gratifying feature of this year's work is the better-quality tow being turned out. For the quarter ending September, 16 per cent. was passed as first grade (against 7 per cent. for the corresponding period of last year), 55 per cent. second grade (48 per cent. last year), 22 per cent. third grade (36 per cent. last year), and 7 per cent. condemned (9 per cent. last year).

COMMERCIAL INTELLIGENCE.

HIDES, SKINS, AND TALLOW.

THE LONDON POSITION.

UNDER date of London, 10th September, the High Commissioner reports:—

I have the honour to acknowledge receipt of your cablegram of the 8th instant reading as follows—"Please cable latest quotations hides, skins, and tallow"—and to advise you that in accordance with the same I have had inquiries made, and have forwarded to you to-day a cable reading as under: "In reply to your telegram of 8th September, very little doing in hide trade. Average price New Zealand 8¼d. Quotations are nominal. Latest quotations sheep-skins (last sale 30th July): Merino—full-woolled 7½d.–9¼d., shorn 4½d.–7½d.; crossbred—fine 8¾d.–11⅞d., coarse 8¼d.–10½d., shorn 5d.–9d. Present quotations are not reliable. There are only a few private sales after that date. Tendency is downward. Next sale will take place on 17th September. Anticipated by brokers considerable fall in prices is likely to occur—1d.–1½d. especially in case of shorns. Will cable result. Tallow sale took place on 9th September. There is a fair demand for better grades; there is no demand for poorer grades. 1,400 barrels offered, 500 barrels sold. Mutton—37s. first-class quality, 34s. medium quality, 27s. inferior quality; beef—34s., 31s., 20s. 6d."

While tanned and dressed leather is in good demand at slightly higher prices than were ruling prior to the war, there has been less demand for raw hides on account of the general dislocation of business and industry. There have not been many New Zealand hides on the market, but those which have been sold have fetched about 8¼d. per pound, a reduction of ½d. to ⅝d. compared with the price ruling at the end of July. The quotations for sheep-skins at present are not very reliable, as they are based more or less on sales which took place immediately prior to the outbreak of war—*i.e.*, on the 30th July. Since that date very few private sales have taken place, but the whole tendency of the market is in a downward direction, and, as stated in my cable, the brokers anticipate a decided fall at the next sale on the 17th instant. The only demand is for long-woolled skins such as may be used in the manufacture of khaki. Medium length and shorn are very little asked for. I will cable you later as to the result of the sale.

At the tallow sale on the 15th August only a small portion of that offered changed hands, and that at about 1s. per cwt. decline from previous prices. Since then, however, there has been a little more demand for higher-grade tallow for edible purposes, and this, in consequence, has recovered in price. There is still very little demand for inferior grades. At the tallow sales yesterday only 500 barrels were sold out of 1,400 offered, and most of those purchased were of superior grade.

As indicated in my cable, the finest quality of mutton tallow amounted to 37s., and beef 34s.

Export of Stock.—The live-stock exported during the month of October was: From Auckland, 7 horses (light mares), 97 sheep, 12 head of cattle, 6 pigs, and 1 crate of poultry, all to the Pacific Isles; from Lyttelton, 11 sheep and 2 head of cattle to Australia, and 33 sheep to South America; from Dunedin, 8 sheep and 2 head of cattle to South America, and 2 head of cattle to Australia.

Stock in Quarantine.—The only imported stock, besides 12 dogs and 13 pups, received into quarantine during the month of October was 1 Ayreshire bull, imported for D. Buchanan, Palmerston North.

The total number of bales of hemp graded in October was 6,033 as compared with 13,447 for the corresponding month of last year, a decrease of 7,414 bales. For the twelve months ending 31st October, 1914, the number of bales graded was 113,710 as compared with 162,973 for the previous twelve months, a decrease of 49,263 bales.

ANSWERS TO CORRESPONDENTS.

CORRESPONDENTS are requested, when desiring information through the Journal in regard to disease in animals and plants, to forward, where possible, affected specimens, in order to facilitate a correct diagnosis of the trouble and to ensure the best advice. In stating a question the most complete descriptive details should be furnished.

Correspondents desiring information in regard to manurial treatment of soil are requested to fill in and forward the prescribed form—"Application for Advice as to Manurial Treatment of Soil"—obtainable from any office of the Department in the Dominion.

In every instance a question to which an answer is desired in these columns must be accompanied by the full name of the inquirer, not necessarily for publication, but as a guarantee of good faith.

Analyses of Soil and Water.

John Christie, Cambridge :—

Will you kindly inform me on what terms the Department undertakes analyses of soils and of water ?

The Agricultural Chemist :—

Forms of application for advice on the manurial treatment of soils can be obtained from the local offices of the Department of Agriculture, or from the Fields Division, Department of Agriculture, Wellington. Forms of application for analysis of water, with directions for collecting samples, will be supplied on request to the Agricultural Chemist, Dominion Laboratory, Wellington. No fees are charged.

Broad Beans.

E. C. Roberts, Thames Street, Morrinsville :—

I find that the blossoms on the broad beans have been and are now falling off, but there is no sign of pods forming. What is the cause ?

The Orchards, Gardens, and Apiaries Division :—

Sometimes in the early part of the season the blossoms of broad beans are perforated at the base by humble-bees. This apparently has the effect of causing them to fall off.

Rye-grass Seed.

"Lolium perenne," Kohuratahi :—

Would you kindly tell me whether Canterbury rye-grass seed, if cut from old pasture, makes as permanent a grass sown on bush burns as Hawke's Bay or Sandon seed ?

The Fields and Experimental Farms Division :—

On this point we have not sufficient information to give definite advice, but we are inclined toward the view that the North-Island-grown seed would be better suited to your conditions, provided it is clean.

Bladder-plum.

F. W. Wood, Waikereru, Rakaunui :—

I am forwarding specimen branch from a plum-tree growing in my orchard. Will you kindly let me know what the bean-like growth is ? A neighbour of mine has a tree similarly covered with these bean-like growths.

The Orchards, Gardens, and Apiaries Division :—

The specimen forwarded has been attacked by a disease known as "bladder-plums," "pocket-plums," &c. This is caused by a minute fungus that lives parasitically in the tissues of the young branches. In the spring, just as the trees are beginning to blossom, part of the mycelium of the fungus extends from the interior of the branch and enters the young ovaries of the flower. It then permeates through the developing fruit and prevents the formation of the stone ; so that, instead of developing into normal plums, the fruit becomes deformed and hollow. The Japanese varieties are especially liable to attack by this disease. In order that this fungus may be controlled, the trees should be sprayed thoroughly in early spring, just as the buds are beginning to swell, with the 10-10-40 formula of the Bordeaux mixture.

Fruit-tree Disease.

Wood Bros., Wainui-o-mata :—

I have noticed that quite a number of our young fruit-trees are suffering from a disease. I enclose for identification a cutting of diseased pear-tree, and also an insect which I found lodged in the split bark. I should be pleased to know whether the insect is the cause of the disease, and what you would advise for treatment.

The Orchards, Gardens, and Apiaries Division :—

The specimen of pear-tree forwarded has been attacked by cicada, commonly known as locust. This pest is specially troublesome in new country, and, unfortunately, no means have yet been discovered for the prevention of injury to fruit and other trees. As the country becomes cleared of bush and shrub the cicada almost entirely disappears. I would advise pruning the trees below the parts badly affected. Spraying with arsenate of lead when the insects are first noticed may check them.

Fancy Cheese.

Algernon E. Green, Dannevirke :—

Can you give me some simple recipe for the making of cream or fancy cheeses ? I think this information would be of some interest to many small farmers, and also to many like myself who read your *Journal* and who keep a cow or two for private use.

The Dairy-produce Division :—

All particulars in connection with the manufacture of soft and fancy cheese, including cream cheese, are set out in detail in a bulletin written by Miss Davies, of the Dairy-produce Division. A copy of this bulletin has been mailed to your address. Further copies of this bulletin are available to any one desiring them.

Tea-tree.

C. P. Nolan, Punawai, Moumoukai :—

On the crown of several spurs I have clumps of white tea-tree shelter bush. It is spreading pretty considerably, and I should like to know what would be the best way of eradicating the young trees, and if you would advise me to cut the clumps down.

The Fields and Experimental Farms Division :—

The only practicable plan is to grub out the young plants. The tree is a free seeder, and no doubt there is a plentiful supply of seed lying dormant on the ground, which will be continually coming up. If possible, I would advise cultivating the land and cropping it. This would probably destroy the seed. If the spurs are bare and devoid of shelter the clumps should be left for shelter purposes, but there is always the dropping of seed to be contended with.

Treatment of Colt.

"Subscriber," Pine Hill, Rototuna :—

I have a light colt just about eleven months old. At what age should I have him castrated ? Is it advisable to have him done if the weather is at all hot ?

The Live-stock and Meat Division :—

You could have the colt operated upon at any time now provided the testicles have descended into the scrotum. It is better to have the operation performed in cool weather, and before flies get troublesome.

Garden Queries.

Richard Backhouse, Epsom, Auckland :—

Please advise on the following :—

1. What steps should I take as regards rust in the stems of celery ?

2. In Mr. Taylor's garden notes on peas he specially mentions Carter's Daybreak and Springtide. Can they be got here, or do you send to London for them ?

3. What steps should I take in regard to loganberries which seem at a standstill, and the leaves are badly riddled by a kind of fly ?

The Orchards, Gardens, and Apiaries Division :—

1. To prevent rust on the stems of celery-plants, spray with Bordeaux mixture, 4-5-50 strength, before the rust appears.

2. Carter's Daybreak and Springtide peas should be procurable from local seedsmen.

3. Probably the loganberries require manuring. Spraying the plants with arsenate of lead should prevent the riddling of the leaves.

Management of Plum-tree.

G. R. Bell, Otaki Railway :—

About twenty months ago I successfully budded a plum-stock, and during last summer the bud grew into a "whipstick" over 4 ft. in height. During the past winter I cut off 80 or 90 per cent. of it. This seems a great waste of growth, and as I have another stock on which a bud is now starting into growth I would like to know if I could profitably cut the scion when it is 6 in. or 8 in. in length and thereby throw the growth into branches. In such a case it seems to me a year would be saved.

The Orchards, Gardens, and Apiaries Division :—

If the stock you refer to is a strong one and the scion sturdy in growth, you might with advantage cut the scion when it is 8 in. or 10 in. in length; but if either stock or scion be at all weak it is not desirable to interfere with the growth during the first season.

Aphis-control.

F. Whale, Fairview, South Beach :—

Would you send me a remedy for the fly that destroys the cabbages and swede-tops ?

The Orchards, Gardens, and Apiaries Division :—

The fly referred to is probably the aphis which attacks swede-tops and cabbages. This pest can be controlled by spraying with a tobacco wash in the following proportions : 1 lb. strong tobacco or 3 lb. waste tobacco, 3 lb. soft-soap, 20 gallons water. If the plants are young, use about twice as much water as that given in the above formula, if necessary, gradually increasing the strength of the wash as the season advances and growth hardens. Another good spray for the control of aphis is 1 cake of Sunlight soap boiled in 3 gallons of water and applied with a fine spray, care being taken to see that the under-sides of the leaves are covered with the fluid.

Lice on Calves.

George Street, Whareama :—

Kindly tell me what to do with cows affected as follows : The hair comes off in patches, the root of the tail and along the backbone as far as the hips being the first part to suffer, and also the sides of the neck, which appear to itch a good deal, as the cows rub against anything they can find. I notice that the skin appears to be covered with a scale or scurf, and in one instance I noticed a few lice. With the exception of two the cows are in fair condition. What is a good remedy for lice on calves ?

The Live-stock and Meat Division :—

We should say that the lice are the cause of the rubbing and consequent loss of hair. Care must be taken in dressing calves for lice that nothing is applied that will injure the animals, owing to their habit of licking themselves and others. Probably the best application is sulphur ointment. The first dressing will kill the lice, but not the eggs, or "nits," and as these hatch out in about eight days it is necessary to repeat the dressing at the end of that period.

Lamb Percentage.

"Shepherd," Waipawa, Hawke's Bay :—

What is the correct way of reckoning percentage of lambs ? Should the total number of ewes put to the ram be counted or the number put through the yards at docking-time ?

The Live-stock and Meat Division :—

The percentage should be reckoned on the number of ewes put to the ram.

Fruitgrowing.

"Fruit-lover," Box 17, Waimate :—

We have an orchard of young trees about four years old. They blossomed very heavily this year. We have been told that we should leave only about half a dozen of the fruit on each tree. Kindly advise us what to do.

The Orchards, Gardens, and Apiaries Division :—

Well-grown four-year-old trees may be allowed to carry a fair crop. If fruiting heavily, thinning is desirable in order to maintain the vigour of the trees and the production of fruit of normal size. It is certainly not necessary to strip the trees to such an extent as to leave only half a dozen fruit on each tree.

Spraying-mixtures.

T. W. Cameron, Horohoro Valley, Whangarei :—

Would you kindly advise me on the following matters :—

1. Has common sulphur in its ordinary state any value whatever as a fungicide ? (I understand it has not, but I constantly hear of people who use it, with

what result I could not say. I would be glad of an authoritative word on the subject.)

2. Of Bordeaux and other similar mixtures, what is the essential that constitutes the actual fungicide ?

3. What effect upon this essential has excess of lime in the mixture ? Is it detrimental ? (Some say it is not, while others maintain that only just sufficient lime should be used as is necessary to neutralize the copper.)

3B. I often see Bordeaux formulas quoted 6-4-40, 5-5-50, and so forth, the lime being out of proportion to the bluestone, as in 4-4-40. Must not the quantity of lime be determined by the amount required to neutralize the copper ?

4. "Spray immediately." I think I have read that after eight or nine hours the mixture is practically valueless. If it deteriorates as a fungicide so rapidly in bulk, how does it retain its effectiveness as a preventive after it has been sprayed ? What determines the interval at which spraying should be made ? (I have used Bordeaux for some time with good results, but upon the foregoing points I have never been able to obtain any satisfactory information.)

The Orchards, Gardens, and Apiaries Division :—

1. Flowers of sulphur is used effectively for the control of mildew on vines grown both under glass and out-of-doors, and combined with lime for the control of some fungus diseases on fruit-trees.

2. The sulphate of copper in the Bordeaux mixture.

3B. A slight excess of lime is not detrimental to the beneficial effects of the Bordeaux mixture—in fact, it is often recommended for the benefit of those who are not prepared to make the litmus paper or ferro-cyanide of potassium prove that the acidity of the sulphate of copper has been neutralized.

4. Kept in bulk for any length of time a chemical change takes place in the Bordeaux mixture which makes it practically valueless. This change does not take place after the particles of lime and sulphate of copper have become dry upon the trees or plants to which the spray has been applied.

Fruit-culture.

H. Bocking, Kimbolton :—

1. Could you please tell me what to do with a big pear-tree fifteen to twenty-years old which is always covered with flowers but never bears more than about eight or nine pears every season. The tree has never been pruned properly, only the centre high branch cut off some years ago. What sort of manure would be best to give it ?

2. Could you please tell me what sort of manure would be best for apple, plum, and peach trees, and what kind of spray would be best for peach-trees with curly leaf, and what is the best manure for rhubarb-plants.

The Orchards, Gardens, and Apiaries Division :—

1. In all probability the blossom does not set to fruit on account of the want of interpollinization.

2. A good manure for fruit-trees generally is a mixture of superphosphate and bonedust in the proportion of one-third superphosphate and two-thirds bonedust. Peach-trees should be sprayed twice during the year with the Bordeaux mixture, 10-10-40 strength, the first time just after the leaves have fallen in the autumn and the second time just as the buds have commenced to swell. Plenty of well-rotted stable manure is recommended for rhubarb-plants ; failing that, use blood-and-bone fertilizer in liberal quantities.

Gangrene of Udder.

W. H. Duncan, Feilding :—

I had a cow about ten years of age which returned 400 lb. butter-fat last season ; was not a very heavy milker, but a persistent one. She was turned out clean and dry about eight weeks previous to calving, carried calf 292 days, calved

easily at 2 p.m. on a Tuesday, cleaned thoroughly at once, calf was dried and suckling within two hours. The cow was down next morning, and showed, I fancied, some signs of milk-fever. I gave her a drench, milked her out (apparently normal beestings), blew up three quarters and partly fourth, when she got up, staggered for a few minutes, and fed as I brought her in. Left calf suckling at night. Down in morning again; one quarter showed nothing but dark, very foul-smelling blood. I injected boracic acid in this and air in rest, gave her a tablespoonful of powdered nitric, and blanketed loins. Friday morning the whole udder was blue-black and skin had peeled off all teats but one I injected the boracic acid into. Saturday morning breathed with grunting sound and died midday. Very light feathery froth came from nostrils after death, palely tinged with blood. Udder throughout felt peculiarly cold except close up to body. She was a strong healthy cow, a good doer, and came in in real good "nick." Smelt very foul at once after death, and was almost unbearable by the time I buried her—was afraid even to skin her. Can you give any idea by description what was the cause and what remedies should have been taken?

The Live-stock and Meat Division :—

There is no doubt that the cow died from acute mammitis, and it is probable that when you inflated the udder your instrument was not clean, and you introduced some micro-organisms into the milk-ducts. From your description of the symptoms these were probably malignant œdema bacilli. All that we can advise you to do is in every case where you have occasion to inflate the udder, see that the udder is thoroughly washed and clean, and that your teat siphon or tube is thoroughly clean. To ensure this all you have to do is to boil the tube for a few minutes.

Swede Turnips and Hay.

D. A. P., Koiakonui, via Te Awamutu :—

1. What is the best kind of manure to use for a crop of swede turnips? How much per acre? Best time to sow swedes? The soil is fairly loose in places, and other places fairly solid. It is virgin country, just cleared of rather heavy fern and tea-tree. It lies well, fairly level, high and dry. The land is classed as first-class in the Government lease.

2. Will you please give me some information how to go about mowing, raking, and stacking a 15-acre paddock of hay. I expect an average crop. What size stack should I strike out, what shape, &c.? The paddock is easy undulating land. Which is the best method of making a stack waterproof?

The Fields and Experimental Farms Division :—

1. Special turnip-manures are made up by merchants. These are applied at the rate of 2½ cwt. to 3 cwt. per acre. If you prefer to mix your own manure, a good combination is 2 cwt. basic slag, 1 cwt. superphosphate, and 28 lb. sulphate of potash per acre. The land being new, the potash might be omitted. The slag and superphosphate should be applied immediately after mixing. The seed may be sown at any time from now on to February. Sow 12 oz. of seed per acre with the drill on flat, rows 14 in. apart. On heavy land ridging would probably give better results.

2. The proper time for cutting grass for hay is when the crop is just past the bloom and before the seeds have had time to ripen. The grass is mowed, and when it has lain for a day in the sun (if it is an average crop) it is turned over to let the sun get at the other side. This turning is the great point in haymaking. If it is a thin crop and the sun is hot, it may be unnecessary to turn it. The hay is then raked into windrows by means of a horse-rake. If the weather has been suitable it may be put into stack from the windrows, otherwise it is put into "cocks," or fair-sized heaps, until the weather is suitable for stacking. When once the hay has been got into the stack, the stack should be trimmed and topped up as soon as it has settled down. To complete the stack it should have a good, fairly steep head put on it, and this carefully raked down so that rain may be thrown off; or it may be thatched. The stack may be made either round or oblong. Without knowing the weight per acre of the crop it is impossible to state the size the stack should be made.

Lupin.

Herbert A. Christie, Burnside, Otago :—

Can you give me any information regarding the annual lupin for growing on sandhills? What is the name of the lupin, and where can the seed be obtained? I wish to experiment with it on the sandhills in the Green Island Domain.

The Fields and Experimental Farms Division :—

There are three well-known varieties of lupins, distinguished by the colour of the flower. These are yellow (*Lupinus luteus*), blue (*Lupinus angustifolius*), and white (*Lupinus albus*). The yellow and blue are the two varieties most commonly found growing on sandhills. Each variety has proved to be serviceable for planting on sand, but from experiments carried out by the Department the white would appear to be the best. Seed is obtainable from any firm of seed-merchants.

Ringworm.

W. Black, Waihao Gorge :—

Would you give me a cure for ringworm on young cattle? I have tried a good many cures with no effect.

The Live-stock and Meat Division :—

The so-called ringworm is not difficult to cure if you go the right way about it. It is really the invasion of the outer layer of the skin and the roots of the hair by a vegetable parasite or fungus. This causes the formation of a dry crust or scab. It is no use applying anything to the surface of the crust, the real trouble lies beneath. This perhaps is the reason why you have not had any success with your treatment. The best thing to do is to first soften the crusts with a dressing of equal parts of soft-soap and lard. After a day or so get some hot water and a hard brush and remove the crusts. When dry apply an ointment of biniodide of mercury in the proportion of 1 to 10 of lard or vaseline. If the trouble is about the eyes it would be perhaps better to apply tincture of iodine with a brush.

Splints.

"Splints," Springfield Farm, Waihou :—

Is it possible to remove splints of long standing, and, if so, how is it done? Can you give the name of a blister that is strong enough to do so without injuring the horse? I have a colt about eight years old who has developed rather a bad splint on the outside of the near foreleg close up to the knee-joint, which is causing him to run lame at the trot on the hard roads, and as he is a valuable horse I would like to cure him if possible.

The Live-stock and Meat Division :—

It is not always possible to remove splints, and if they do not cause lameness it is as well to let them alone. It often happens that a splint in a young horse will become absorbed naturally before he is six years old. In the case you mention, where the enlargement is on the outside of the leg, we are afraid you will have difficulty in getting the horse sound, especially if the knee-joint is interfered with. We should advise you to try repeated blistering with biniodide of mercury—1½ drams to the ounce of lard or vaseline, and give him a run at grass.

Erratum.—In the article on tomato-culture in last month's *Journal* the cost of the manure for plots Nos. 2 and 3, page 260, was only given for the row. In the former case the total value of the manure employed was £1 6s. 3d., and in the latter case £1 15s. 4d.